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## International Journal of Surgery Case Reports

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# Dormia basket impacted during ERCP, resolved by laparoscopic bile duct approach: Case report

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## ARTICLE INFO

### Article history:

Received 14 December 2020

Received in revised form

28 December 2020

Accepted 28 December 2020

Available online 2 January 2021

### Keywords:

Choledocholithiasis

ERCP

LCBDE

Dormia basket

Transcystic

Choledochotomy

## ABSTRACT

**INTRODUCTION:** Endoscopic retrograde cholangiopancreatography (ERCP) is the method of choice for treating and removing common bile duct (CBD) stones with high success rates. Among the adverse effects, impaction of the Dormia basket when removing the stones is an unusual complication.

**CASE PRESENTATION:** Two cases of choledocholithiasis with endoscopic treatment by ERCP and Dormia basket impaction, resolved by a laparoscopic approach to the bile duct.

**DISCUSSION:** Laparoscopic common bile duct exploration (LCBDE) has been developed as a technique to treat choledocholithiasis and simultaneously vesicular lithiasis by laparoscopy. LCBDE can be by means of a transcystic approach or by choledochotomy. The success of the treatment depends on surgical experience and the availability of adequate equipment, with high effectiveness to eliminate CBD stones and a success rate greater than 95%, it is equally effective for the resolution of adverse events during ERCP.

**CONCLUSION:** LCBDE provides an alternative therapy where there is no other type of treatment for the resolution of complications of ERCP. It is a safe, effective and reliable technique with high success rates, which offers the benefits of a minimally invasive approach.

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## 1. Introduction

CBD stones are the result of gallstone migration from the gallbladder (GB) into the biliary tree. These stones are the result of oversaturation of cholesterol in the bile, inadequate levels or function of bile salts, and decreased contractility of the bile epithelium due to the multifactorial effects of diet, hormones, and genetic predisposition. Prospective population data reveal that 10% of adults will develop symptomatic gallstones within a decade. Those with 10%–20% symptomatic cholelithiasis have concomitant choledocholithiasis [1,2]. Since its introduction in 1974, ERCP has become the standard method for removing bile duct stones, which involves endoscopic sphincterotomy with balloon or basket for removal of stones. The success rate for removal of common bile duct stones

ranges from 80 to 90% [3,4]. An unusual but possible complication is Dormia basket impaction or Traction cable breakage when removing CBD stones. An expert study reported that the complication rate associated with the use of the Dormia basket, due to a stone of hard or large consistency (> 1 cm), is a complication ranging from 0.8 to 6% of cases [5–7]. Therefore, it deserves an urgent resolution; however, at the moment, there is no consensus on the optimal technique or the behavior to follow for the resolution of this complication [2,8].

### 1.1. Objective

To present two cases of Dormia basket impaction during ERCP due to choledocholithiasis that were satisfactorily resolved by laparoscopic exploration of the bile duct.

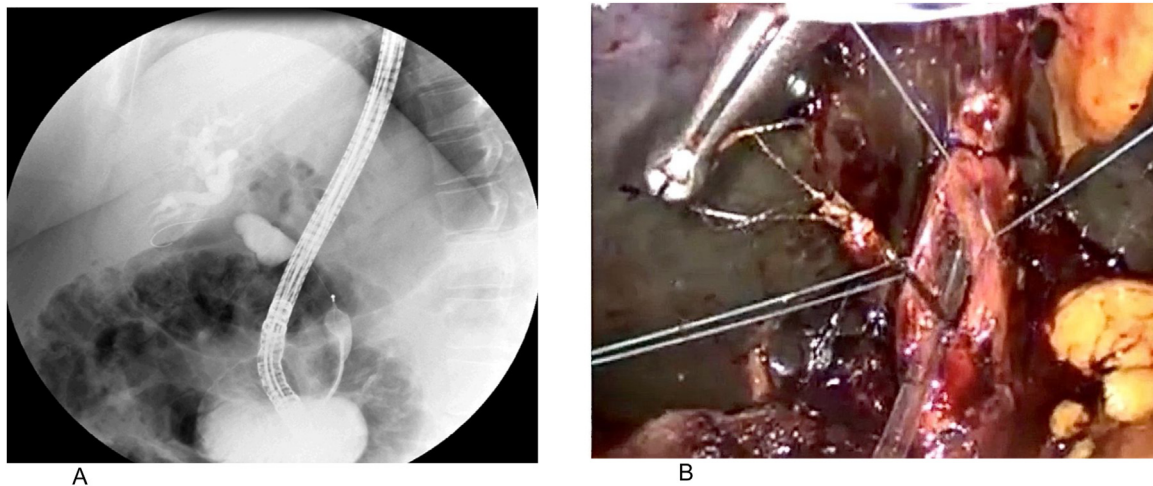
## 2. Presentation of cases

### 2.1. Case 1

A 37-year-old female patient with a history of laparoscopic cholecystectomy in the previous four years; the patient began to suffer three days earlier from abdominal pain predominantly in the upper right quadrant, which radiated to the lumbar region and

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**Fig. 1.** A: Fluoroscopy during ERCP. Calculus is observed in the common bile duct with an impacted Dormia basket. B: Stone and impacted Dormia basket extraction.

was accompanied by nausea and vomiting. On physical examination, with stable vital signs, mucous membranes and integuments with icteric tinge (+++ / +++ +), Murphy's sign (+), without hepatomegaly or splenomegaly, the rest within normal range. Laboratory tests reported: Leukocyte count of 6500/mcL, neutrophils 53%, total bilirubin (BT) 15.4 mg/dL, direct bilirubin (BD) 8.8 mg/dL, gamma-glutamyl transpeptidase (GGT) 266 U/L, rest within normal parameters, magnetic resonance cholangiopancreatography (MRCP) was performed for suspected choledocholithiasis, with which the diagnosis was confirmed, with a report of a 15-mm intraluminal image that prevents bile flow, also with a finding of 20-mm intrahepatic and extrahepatic dilatation of the main bile duct. She undergoes ERCP for therapeutic purposes by the endoscopy service (Fig. 1a), performing sphincterotomy and extraction of the stones; however, the entrapment of the Dormia basket in the common bile duct is reported, which is why an emergency surgical resolution is decided, carrying out a bile duct exploration and extraction of the Dormia basket (Fig. 1b) and stones Laparoscopically with primary choledochorrhaphy. The postoperative evolution was uncomplicated and the patient was discharged 7 days postoperatively. Convigilance at 6 months without eventualities.

## 2.2. Case 2

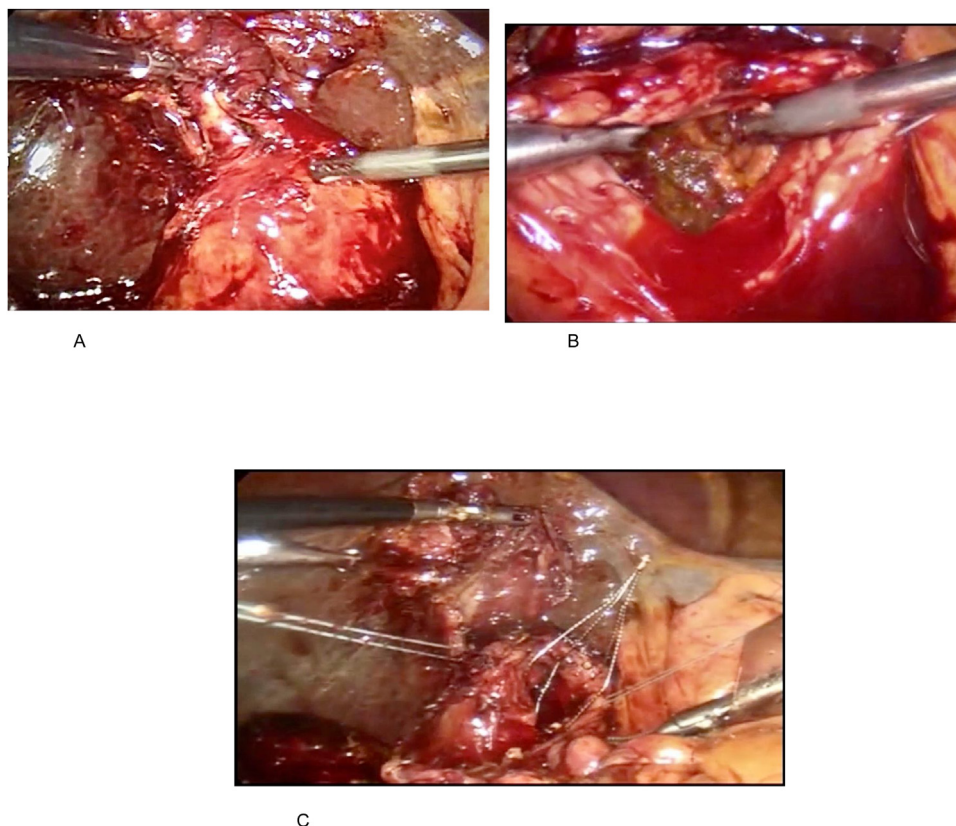
65-year-old female patient, with no relevant history. It begins with abdominal pain of 48 h of evolution, in the right upper quadrant and non-quantified fever with symptomatic management using non-steroidal analgesics (NSAIDs) without improvement. On physical examination, with stable vital signs, jaundiced mucosa and integuments (+++ / ++++), Murphy's sign (+), no evidence of peritoneal irritation, the rest are irrelevant. Laboratory studies with leukocytes 9400/mcL, neutrophils 68.3%, hemoglobin 14.4 g/dL, total bilirubin (BT) 18.29 mg/dL, direct bilirubin (BD) 10.29 mg/dL, indirect bilirubin (BI) 8.0 mg/dL, gamma-glutamyl transpeptidase (GGT) 258 U/L. USG showed intrahepatic and extrahepatic bile duct dilatation of up to 12 mm with a gallbladder measuring 64 × 42 × 31 mm, with a 2 mm wall. Abdominal CT with condilation of the bile duct and choledochal junction up to 29 mm, with a regular and defined edge image of 28 mm inside the main bile duct. The endoscopy service decides diagnostic and therapeutic ERCP, sphincterotomy was performed, however, the lithiasis is of large elements that prevents its extraction with a Dormia basket, resulting in its entrapment in the main bile duct. An emergency laparoscopic approach is decided to explore the biliary pathway, with findings of a 2 × 3 cm scleroatrophic gallbladder, dilatation

of the common bile duct of 3 cm, with a stone of 3 cm inside, trapped in the Dormia basket (Fig. 2a, b, c). The stone was extracted with an impacted basket with complete clearance of the bile duct, primary choledochorrhaphy plus cholecystectomy was performed. During the postoperative period, there was a biliary leakage due to drainage of up to 150 mL/day, for which support was requested from the endoscopy service for the placement of an endoprosthesis. The course evolved favorably and she was discharged without complications on the tenth day of the postoperative period. Endoprosthesis was successfully removed after 6 weeks, with follow-up without complications for six months.

## 3. Discussion

Treatment of CBD stones has progressed from open bile duct exploration to endoscopic treatment using ERCP, with a success rate of more than 90% [9,10]. However, in approximately 10%–15% of patients, there are factors that complicate this procedure, such as difficulties in accessing the bile duct, which may foresee difficulty in executing ERCP successfully. The criteria for difficult cannulation are: more than five times of contact with the papilla during cannulation attempts, more than five minutes in the attempt at cannulation or cannulation of the pancreatic duct more than once during the procedure. In these cases, the European Society of Gastrointestinal Endoscopy (ESGE) recommends the early use of the precutting or the double wire-guided technique, as well as the rendezvous procedure in patients scheduled for laparoscopic cholecystectomy who also have the diagnosis of choledocholithiasis [11–14]. Another problem faced by the endoscopist, once the cannulation has been performed, is the large number of stones (greater than 10), large stones (diameter >15 mm), stones of unusual shape or location (intrahepatic, cystic duct, proximal to stenosis) and Mirizzi syndrome; with an increase in adverse events or complications up to 6%–15% [15–18].

Some of the complications reported in endoscopic management are pancreatitis (3.5%–9.7%), hemorrhage (0.3%–9.6%), cholangitis (0.5%–3.0%), perforation (0.08%–0.6%) and, occasionally, basket impaction during the extraction of a CBD stones [18]. The Dormia basket generally consists of four stainless steel wires arranged at 90 degrees radially that open over a stone to allow capture and extraction. An incidence of impaction or rupture of a Dormia basket with a trapped stone is reported in up to 6% of cases; however, due to the great advances in techniques for the treatment of CBD stones, this has decreased to 0.8%. The main factor responsible for the impaction of the basket and as described in the cases we report,



**Fig. 2.** A: Dilated common bile duct secondary to large calculus with impacted Dormia basket. B: Choledochotomy with exploration of the common bile duct. C: Removal of calculus and Dormia basket impacted by choledochotomy in laparoscopic bile duct exploration.

is the large size of the stones (>15–20 mm). Some authors have reported that the presence of a stone larger than 20 mm in size as a contraindication to performing ERCP [6,19,20].

In general, basket impaction occurs in the ampulla of Vater and multiple ways to recover the impacted basket are described, performing a variety of strategies such as extracorporeal shock wave lithotripsy (ESWL), balloon dilation, a second Dormia basket, salvage mechanical lithotripsy, laser lithotripsy, rat tooth forceps, sphincterotomy extension, and open or laparoscopic surgery. However, to date there is no consensus on the treatment of choice [6,21–23].

The most commonly described treatment of an impacted Dormia basket is through the use of mechanical/laser lithotripters or ESWL [24–26]. This results in a high clearance after one session of up to 92%, but a subsequent endoscopy is required to remove the impacted basket, remove stone fragments, and achieve definitive clearance of the canal [27–29]. However, it is not possible to carry it out in all centers since not all have the resources, such is the case of our hospital. Other possible endoscopic techniques were unsuccessful and due to the high risk of presenting a major complication, it was decided to urgently perform a laparoscopic examination of the CBD (LCBDE), since the delay in treatment can increase the severity of any complication such as pancreatitis, cholangitis and sepsis.

Over the past 20 years, LCBDE has been developed as a technique to treat CBD stones and can simultaneously treat gallbladder stones using laparoscopic cholecystectomy (LC) [30–32]. It has become a mainstay for this type of condition whether it is performed through a transcystic approach or through direct choledochotomy. The success of the treatment depends on surgical experience and skill, the appropriate equipment available, and knowledge of the biliary anatomy. LCBDE by an experienced laparoscopic surgeon is a safe

and highly effective method of stone removal with a rate greater than 95%. It has the advantage that it can be complemented by a cholangiography or a flexible intraoperative choledochoscopy for 100% resolution certainty [30,33–35]. The most common complication for LCBDE is bile leakage caused by retained stones, which can occur in up to 10%–14% of cases, making it necessary to perform a second ERCP for the management of postoperative bile leakage and for the extraction of retained stones if necessary [30,36].

With respect to the placement of a T-tube or primary closure of the choledochotomy when performing LCBDE, multiple studies have reported that drainage with a T-tube after open choledochotomy seems to increase operating time, hospital stay, as well as the presence of complications (fluid and electrolyte disturbances, sepsis, premature tube displacement, bile leakage, localized pain at extraction site, biliary peritonitis, prolonged biliary fistulas, and late biliary stricture) compared with primary closure [37,38]. One of the reasons to consider the use of T-tube drainage is to decompress the common bile duct in the presence of a distal common bile duct obstruction. This is to prevent bile leakage and biliary peritonitis; however, when sphincterotomy is performed in ERCP, the pressure of the CBD is much lower, favoring the drainage of bile and if it is accompanied by a CBD diameter >1 cm, which further reduces the pressure within the biliary tree. Therefore, the risk of biliary leakage or biliary peritonitis when performing the primary closure of the choledochotomy is very low, which is the reason why the two patients we present underwent primary choledochorrhaphy [39].

In our experience when performing this type of procedure and what has been previously reported in the literature, we opted for primary closure versus T-tube placement in most of our patients, provided there is no contraindication, so far with good results. It is important to note that we do not have any other alternative therapy for the resolution of these types of complications, such as ESWL. Our

unit is characterized by having extensive experience in the management of the bile duct by laparoscopy, being a therapeutic alternative for some of the endoscopic complications when they occur.

#### 4. Conclusion

LCBDE provides an alternative therapy where there is no other type of alternative treatment for the resolution of ERCP complications. It is a safe, effective and reliable technique with high success rates and minimal complications when performed by surgeons with the necessary experience and skills. In addition, it offers the patient all the benefits of a minimally invasive surgery. This case report has been arranged in line with SCARE guidelines [40].

#### Declaration of competing interest

None.

#### Funding

None.

#### Ethical approval

This case report is exempt from ethnical approval in our country.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Author contribution

Arcenio Luis Vargas Avila: Study concept and design.  
 Jesus Antonio Martin Perez: Data collection.  
 Julian Vargas Flores: Data collection.  
 Jorge Alejandro Dominguez Rodriguez: Data analysis.  
 Israel De Alba Cruz: Data analysis or interpretation.  
 Josue Andres Gonzalez Luna: Writing the paper.  
 Luis Guerrero Galindo: Writing the paper.  
 Luis Antonio Cab Cesar: Writing the paper.

#### Registration of research studies

Not Applicable.

#### Guarantor

Israel de Alba Cruz MHS.MD.

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

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