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Case Report

Open common bile duct exploration with primary closure treatment of complicated choledocholithiasis: a case report and literature review

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ABSTRACT

Choledocholithiasis, a common complication of cholelithiasis, presents significant challenges in management, particularly in cases involving multiple or large stones. This case report describes a 55-year-old woman with multiple choledocholithiasis complicated by acute biliary pancreatitis, cholangitis, and cholecystitis. Initial management included endoscopic retrograde cholangiopancreatography (ERCP) with biliary stenting due to unsuccessful stone extraction, followed by open common bile duct (CBD) exploration with primary closure. The patient's postoperative course was notable for a self-limiting grade A biliary leak, which resolved spontaneously. This case highlights the efficacy of primary closure in selected patients with a dilated CBD, despite the inherent risk of bile leakage, and underscores the importance of a multidisciplinary approach tailored to resource availability and surgical expertise. The findings in this case support primary closure as a viable option for complex choledocholithiasis, offering shorter hospital stays and reduced complications when performed in appropriate clinical settings.

Keywords: Choledocholithiasis, Common bile duct exploration, Primary closure, Biliary pancreatitis, Cholangitis

INTRODUCTION

Choledocholithiasis, defined as the presence of stones in the common bile duct (CBD), is a frequent complication of cholelithiasis, with a prevalence ranging between 10% and 20% in patients with symptomatic gallstones.[1-4] These stones can be classified as primary, formed directly in the CBD, or secondary, originating in the gallbladder and migrating to the CBD.[5-7] Among the associated risk factors are advanced age, female sex, obesity, dyslipidemia, history of biliary surgery or cholelithiasis, and anatomical alterations such as gastric bypass.[2-4,6,8] Additionally, conditions like rapid weight loss, type II diabetes, and the use of oral contraceptives also increase the risk.[6,9] Historically, the management of this condition was based on open surgery with choledochotomy and T-tube placement, but currently, minimally invasive techniques such as endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic CBD exploration (LCBDE) have revolutionized treatment.[7,9-12] Complications associated with choledocholithiasis include cholangitis, acute pancreatitis, liver abscesses, and obstructive jaundice.[6,7,9]

The pathophysiology of choledocholithiasis is explained by an imbalance in bile components, such as cholesterol, bilirubin, and bile salts, which promotes the formation of stones, either cholesterol stones (80% of cases) or pigmented stones (black or brown).[6] Factors such as bacterial infections, reduced bile flow, and metabolic alterations also contribute to their development.[6,7] This process can be aggravated by biliary stasis and bacterial overgrowth.[13]

Clinically, choledocholithiasis may be asymptomatic in up to 60-80% of cases, or manifest with symptoms such as abdominal pain in the right upper quadrant or epigastrium, which may radiate to the scapula (43.4-90.7%

of cases).[1,6,8,9,12] Jaundice, present in 15-34.4% of patients, is often accompanied by dark urine and acholic stools.[2,6,12,13] In more severe cases, acute cholangitis may develop, characterized by the triad of fever, pain, and jaundice (37.7% of cases), or biliary pancreatitis (3.9-9.8%).[2,12,13,16] Nonspecific symptoms such as nausea, vomiting, and dyspepsia may also be observed.[6,9] In complex situations, such as in patients with COVID-19, cholangitis may progress to septic shock.[13]

The diagnosis of choledocholithiasis begins with non-invasive tests such as abdominal ultrasound, which has a sensitivity of 73% for detecting CBD stones, though its utility is limited in the distal portion of the duct.[2,5,6] Liver function tests, including bilirubin (values above 1.7 mg/dl suggest obstruction), alkaline phosphatase (ALP), and γ-glutamyltransferase (GGT), are essential for assessing biliary involvement.[2,6,7] In cases of intermediate suspicion, advanced techniques such as magnetic resonance cholangiopancreatography (MRCP), with a sensitivity of 90-93% and specificity of 96-100%, or endoscopic ultrasound (EUS), with a sensitivity of 95-97% (especially useful for stones smaller than 5 mm), are preferred.[2,5,6,14] ERCP, considered the gold standard for diagnosis and treatment, is reserved for cases with a high probability of choledocholithiasis (>50%) due to its invasive nature and the risk of complications such as pancreatitis (1.3-12%).[5,7,13] The management algorithm recommends direct ERCP in high-probability patients, whereas in cases of intermediate or low probability, EUS or MRCP is suggested before proceeding to ERCP.[2,5,7]

The treatment of choledocholithiasis includes various therapeutic options depending on patient characteristics and available resources. ERCP with sphincterotomy is one of the most used techniques, with a success rate of 80-90% in stone extraction, though it carries risks such as pancreatitis (1.3-6.7%), hemorrhage, and perforation.[2,4,7] For large stones, endoscopic papillary balloon dilation (EPLBD) is an effective alternative.[3,7] On the other hand, laparoscopic CBD exploration offers the advantage of resolving the problem in a single procedure, with lower recurrence rates compared to ERCP.[4,11,12,15] Among LCBDE techniques, the transcystic approach is preferred for small stones (<8 mm) due to its lower bile leak rate (0-3.2%), while the transductal approach is used for large or multiple stones, with options for primary closure or T-tube placement.[4,11,14,15] Primary CBD closure is associated with a shorter hospital stay (4.5-6.59 days) and reduced costs, though it carries a higher risk of bile leakage (2.6-17.2%).[1,10,15,16] In contrast, the T-tube has a lower incidence of leaks (2.6-4.84%) but may be complicated by infections or dislodgment.[1,9,16] Other alternatives, such as plastic biliary stents, are useful for reducing stone size or number within two months (93% success rate), while removable metal stents are reserved for complex cases or high-risk patients.[2,17,18] Current guidelines recommend LCBDE in experienced centers, especially for patients with a CBD ≥7 mm, and ERCP for those with high surgical risk or complex anatomies.[2,4,7,11,12]

Among the complications associated with choledocholithiasis treatment are pancreatitis, hemorrhage, and perforation in the case of ERCP, as well as bile leakage (0-26.7%) and surgical site infection in LCBDE.[1,2,4,7,11,12,16] The use of a T-tube may lead to infections, dislodgment, or strictures.[1,9,10] Regarding prognosis, stone recurrence is more frequent in patients with multiple stones or a dilated CBD (>13 mm), while perioperative mortality remains below 1.3-3.6%.[2,11,12]

CASE REPORT

This is a 55-year-old woman with no significant medical history except for a recent episode of dengue without severity (one month prior) and bilateral tubal occlusion (23 years ago). She reports no allergies, smoking, alcohol use, or other relevant conditions.

The patient began experiencing symptoms two weeks before admission to Hospital de San Pedro (20 December 2024), starting with colicky pain in the right hypochondrium, initially managed with over-the-counter analgesics and antispasmodics. However, the pain progressed, becoming more diffuse and radiating to the right scapula, accompanied by jaundice, nausea, postprandial vomiting, and chills in the days leading up to hospitalization.

Initial laboratory tests revealed amylase 4,600 U/l, lipase 1,216 U/l, total bilirubin 6.45 mg/dl (direct 2.08), aspartate aminotransferase (AST) 306 U/l, alanine aminotransferase (ALT) 432 U/l, alkaline phosphatase (ALP) 409 U/l, leukocytes 13.33 10^3/µl (neutrophils 90.7%), and gamma-glutamyl transferase (GGT) 1,659 U/l. Ultrasound showed cholelithiasis with wall thickening (6-8 mm), CBD diameter of 6 mm, moderate intrahepatic bile duct dilation (2-3 mm), and mild hepatomegaly with moderate steatosis.

Based on these findings, the diagnosis was established as mild acute biliary pancreatitis (Ranson 1, BISAP 0, Atlanta 0), mixed-pattern hepatitis (R factor 3.9), moderate acute cholecystitis (Tokyo guidelines grade II), and moderate acute cholangitis (Tokyo guidelines grade II). Management was initiated with fasting, fluid therapy, analgesics, and dual antibiotic therapy.

The following day (21 December 2024), she was transferred to ISSSTE Regional Hospital Torreón for further evaluation. Magnetic resonance cholangiopancreatography (MRCP) (22 December 2024) revealed diffuse dilation of the intra- and extrahepatic biliary tree (up to 18 mm), four stones in the CBD (0.8–1.1 cm), and a hydropic gallbladder with thickened walls (4 mm).

On 27 December 2024, an endoscopic retrograde cholangiopancreatography (ERCP) was performed, confirming biliary duct dilation (22-24 mm) with multiple large stones. Due to the inability to remove them

endoscopically, a 10 Fr plastic stent was placed, draining 100 ml of mucopurulent material.

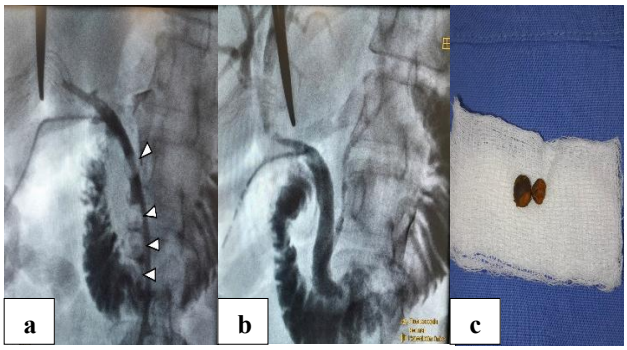

Figure 1: (a) Fluoroscopy revealing the presence of 4 large stones in the common bile duct (arrowheads), (b) fluoroscopy after common bile duct exploration, showing proper contrast flow through both hepatic ducts, common hepatic duct, and common bile duct into the duodenum, with no apparent filling defects, and (c) intact extraction of 2 out of the 4 stones observed during fluoroscopy.

She was discharged on 06 January 2025 with outpatient management due to low biliary output (80 cc/24h), good general condition, and adequate oral tolerance. At follow-up (16 January 2025), the biliary leak resolved spontaneously (output of 5 cc non-biliary/24h), and the drains were removed. The patient completed her recovery without complications.

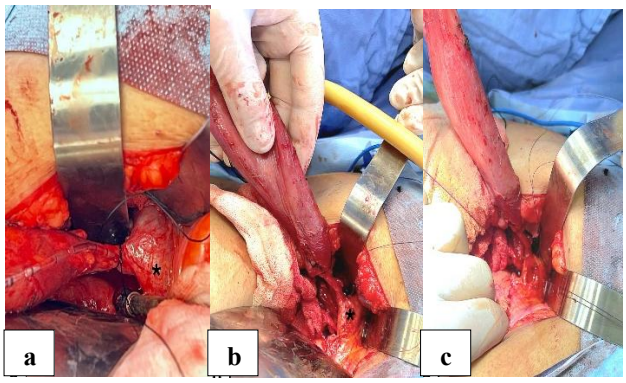

Figure 2: (a) Transcystic approach using a pediatric feeding tube for fluoroscopic control, (b) dissected gallbladder, exposing the cystic duct and common bile duct, and (c) anterior choledochotomy prior to bile duct exploration.

Note the significant dilation of the common bile duct. (*: common bile duct)

On 31 December 2024, an open cholecystectomy with bile duct exploration was performed. Using a transcystic approach and fluoroscopy, biliary tract exploration was then carried out via choledochotomy; two intact stones and several fragmented ones were extracted, with radiographic confirmation of adequate bile flow. Primary closure of the CBD was performed, and a Penrose drain was placed.

During the postoperative period (01 January to 06 January 2025), the drain initially showed serosanguineous output (60 cc/24h), later evolving to biliary output (150 cc/24h on 01/04 and 120 cc/24h on 01/05), classified as a grade A (mild) biliary leak according to the International Study Group of Liver Surgery. Laboratory tests demonstrated progressive improvement: total bilirubin 1.1 mg/dl (01/03), residual leukocytosis (19.3×10^3/µl), and decreasing liver enzymes.

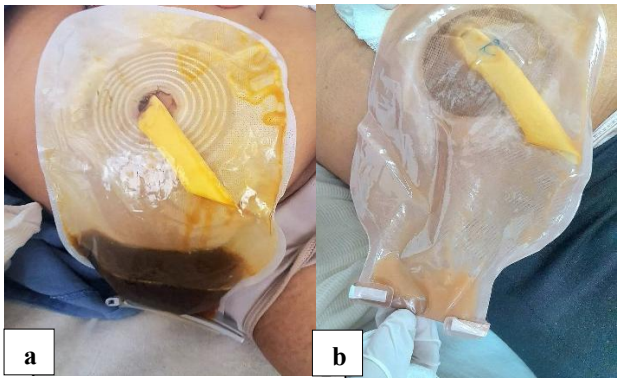

Figure 3: (a) Drainage with bile output at the time of patient discharge on the 6th postoperative day, and (b) drainage with minimal serous output and resolution of bile leakage 2 weeks after discharge.

DISCUSSION

The presence of multiple stones in the common bile duct is a rare condition with limited evidence, particularly in cases involving large stones. The prevalence of multiple choledocholithiasis is not well described in the available literature. However, based on a study by Horiuchi et al, in which 22 out of 208 patients diagnosed with choledocholithiasis had more than three stones in the bile duct, it can be estimated that this condition occurs in approximately 10% of patients with this disease.[17] Considering that the prevalence of choledocholithiasis is 10–20% in patients with symptomatic gallstones, it can be deduced that such cases may represent 1–2% of patients requiring medical attention for cholelithiasis.

This clinical case illustrates the complex management of multiple choledocholithiasis complicated by acute biliary pancreatitis, cholangitis, and cholecystitis. The diagnostic-therapeutic approach largely aligns with current guidelines and evidence, though with particularities that warrant discussion compared to the reviewed literature.

Initial management with antibiotic therapy and ERCP due to the inability to perform primary stone extraction reflects a stepwise approach, like that described in the SAGES guidelines and the study by Horiuchi et al, where temporary plastic stents are used to decompress the biliary tract in complex cases.[2,17] Also, previous evidence concludes that early ERCP should be considered in patients with biliary pancreatitis and coexisting cholangitis or biliary obstruction.[19]

The decision to perform open cholecystectomy with common bile duct exploration and primary closure was appropriate given the failed ERCP and marked dilation of the bile duct (18–24 mm), meeting the criteria for primary closure described in multiple studies (diameter ≥8 mm, absence of severe bile duct inflammation.[1,15,16] Although laparoscopic surgery is preferred in most guidelines, the open approach may be necessary in centers with technical limitations or in cases of complex anatomy, as reported in resource-limited settings.[4,10,11] Stone extraction under fluoroscopy and primary closure without a T-tube aligns with current trends favoring this technique due to shorter hospital stays, fewer postoperative complications associated with tube use, and reduced costs.[15,20,21]

Although the postoperative biliary leak highlights the risk described in studies such as Zhang et al, where the leakage rate with primary closure was 17.2%, this relative disadvantage appears to depend more on experience and training in this type of procedure, provided other contributing factors are ruled out, primarily a bile duct diameter less than 8 mm and residual stones.[1,11] This is supported by evidence from studies showing no significant differences in postoperative bile leakage or stenosis between primary closure and T-tube use.[16,21]

In this case, although the prior sphincterotomy does not align with the ideal indications for considering primary closure in patients with choledocholithiasis, the risk of residual stones in this particular context—judging by the difficulty of extraction during the procedure and the inability to remove all stones intact—may outweigh the long-term risks associated with sphincterotomy, such as retrograde biliary infection, recurrent gallstones, and papillary stenosis.[1,12,16,22] On the other hand, according to Naraynsingh et al, ensuring free bile drainage into the duodenum is advisable so that residual stones can pass into the duodenum without causing symptoms, thereby minimizing the risk of residual choledocholithiasis. This approach also eliminates the need for stents or T-tubes to facilitate drainage. However, in this case series, this was achieved by dilating the sphincter of Oddi using an 8–9 Fr Bake dilator.[10]

Although the presence of a sphincterotomy may increase the short-term risk of bile leakage due to possible duodenal juice reflux, the favorable outcome with spontaneous resolution of the leak and improved lab results is comparable to studies such as Wang et al and Zhilong et al, where minor leaks were managed conservatively.[12,16] The absence of residual stones postoperatively aligns with the high success rates reported in LCBDE (94–98%), although this case required open surgery due to the lack of laparoscopic availability.[11,12]

While advancements in minimally invasive and endoscopic techniques, such as laparoscopy and ERCP, have improved therapeutic outcomes compared to traditional open bile duct exploration, this has also led to the underutilization of the therapeutic advantages of traditional techniques. Meanwhile, new disadvantages have emerged, particularly regarding hospitalization duration, treatment costs, and procedure-specific complications.[4] However, current evidence suggests that the ideal management of such cases involves combining minimally invasive approaches, such as laparoscopy, with direct bile duct exploration in selected cases to minimize risks and treatment costs. Nevertheless, the decline in traditional techniques, lack of surgical experience and training programs, and limited resource availability remain collective obstacles to the optimal treatment of such unique cases.

CONCLUSION

This case exemplifies successful multidisciplinary management of complex choledocholithiasis, aligned with current evidence but adapted to technical limitations. It highlights the importance of multimodal diagnosis, flexibility in surgical approach, and the safety of primary closure in selected cases, while underscoring the need to individualize treatment based on available resources and surgical team expertise. It also emphasizes the need to weigh the necessity and feasibility of first-line endoscopic intervention, assessing the risk of failure associated with the specific characteristics of choledocholithiasis versus the need for endoscopic drainage in cases of acute obstructive cholangitis, so to optimize and expedite definitive management.

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