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Case Report

Surgery Section

Laparoscopic Management of Type I Choledochal Cyst in an Adult: A Case Report

PRACHI PRAVEEN AGRAWAL[1], ABHIJIT S JOSHI[2]

ABSTRACT

Choledochal Cysts (CC) are rare dilatations of the common bile duct and are most frequently diagnosed in the pediatric age group. However, some patients are diagnosed in adulthood. Treatment options (endoscopic or surgical) depend on the type. With the advent of minimally invasive surgery, patients in whom surgical treatment is indicated are increasingly managed by either laparoscopic or robotic approaches. Herein, we report the case of a 27-year-old woman with CC who underwent laparoscopic therapy. It was a large Type I CC diagnosed on ultrasound and confirmed by Magnetic Resonance Cholangiopancreatography (MRCP). The rationale for reporting this case is to underscore that it is feasible to excise even a large Type I CC and re-establish bilioenteric continuity entirely by laparoscopy.

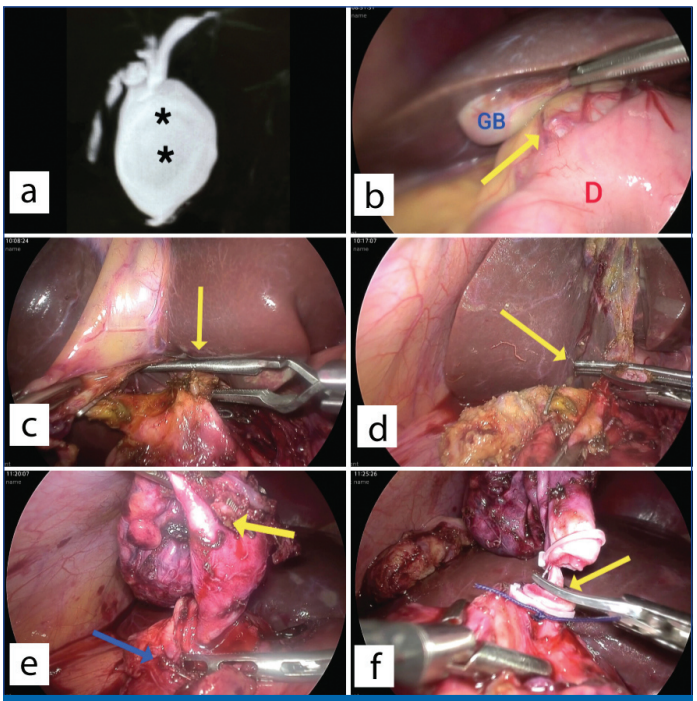
Keywords: Bile duct, Dilatations, Endoscopic, Minimal invasive surgery, Paediatric, Robotic

CASE REPORT

A 27-year-old woman presented to the Surgical Outpatient Department (OPD) with complaints of right upper quadrant abdominal pain associated with dyspepsia and occasional nausea for 3-4 months. On physical examination, her vitals were normal, and she had no signs of pallor or icterus. She had a palpable, ill-defined lump in the right upper quadrant of the abdomen, with tenderness. Laboratory tests revealed a white blood cell count of 8,860 /cu.mm, haemoglobin of 10.9 g/dL, and platelets of 4.06 lac/cu.mm. Her liver function tests were as follows: total bilirubin 0.70 mg/dL, conjugated bilirubin 0.30 mg/dL, unconjugated bilirubin 0.40 mg/dL; Aspartate Aminotransferase (AST) 33 U/L, alanine aminotransferase (ALT) 23 U/L, and Alkaline Phosphatase 64 U/L.

Abdominal ultrasound suggested a 7.1×3.9 cm well-defined cystic structure along the mid-distal common bile duct. The cyst was displacing the duodenum and causing mass effect on the head of the pancreas. These features suggested a Type Ic CC. She was advised to obtain Magnetic Resonance Cholangiopancreatography (MRCP). It revealed fusiform dilation of the extrahepatic bile duct along its entire length, approximately 7 cm in length with a maximum width of 4.7 cm, features suggestive of a Type I CC [Table/Fig-1a]. The patient and her family were counselled for laparoscopic therapy, and they agreed. She then underwent routine preoperative evaluation and workup and was admitted to the hospital to be taken up for surgery after confirmation of fitness for general anaesthesia.

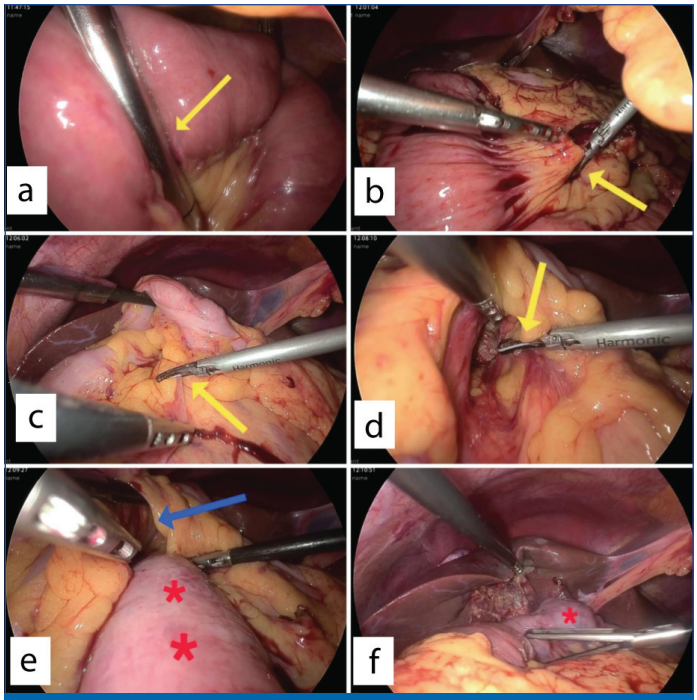
The surgery was performed with the patient in a supine position, with both legs straight, split up and firmly strapped to the table- The operating surgeon stood between the patient's legs. At laparoscopy, the imaging findings were first confirmed [Table/Fig-1b]. The CC was carefully skeletonised after separation from the hepatic artery and portal vein. It was clamped proximally just distal to the ductal confluence, with a vascular Bulldog clamp [Table/Fig-1c]. It was then transected just distal to the clamp [Table/Fig-1d]. The gallbladder (GB) was mobilised from its fossa on the liver. The dissection along the bile duct was then advanced distally toward its lower end. The lower



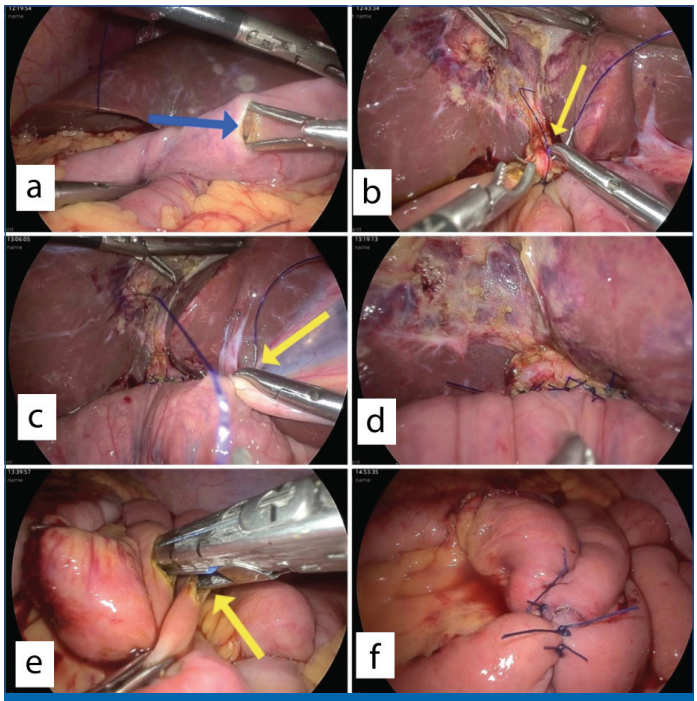
[Table/Fig-1]: a) MRCP image revealing CC (black asterisks); b) 1st look lap revealing CC (yellow arrow); c) Proximal clamping of CHD (yellow arrow); d) Division of CHD (yellow arrow); e) Distal dissection within the head of pancreas (blue arrow); f) Distal division of CBD(yellow arrow).

end was mobilised from within the head of the pancreas, skeletonised, and divided between haemoclips and ligatures [Table/Fig-1e,f].

Haemostasis was achieved, and a local toilet was performed. The loop of proximal small bowel was then fashioned after transection approximately 20 cm distal to the duodenojejunal flexure [Table/Fig-2a,b]. A window was created in the transverse mesocolon to the right of the middle colic pedicle, and the distal limb was passed through the window to bring it into the supra-colic compartment [Table/Fig-2c-f]. A jejunotomy was performed, and an end-to-side bilioenteric anastomosis was fashioned using 3-0 polydioxanone simple interrupted sutures after unclamping the proximal cut end of the common hepatic duct [Table/Fig-3a-d]. A stapled and sutured Jejuno-jejunostomy was then created using an Endo

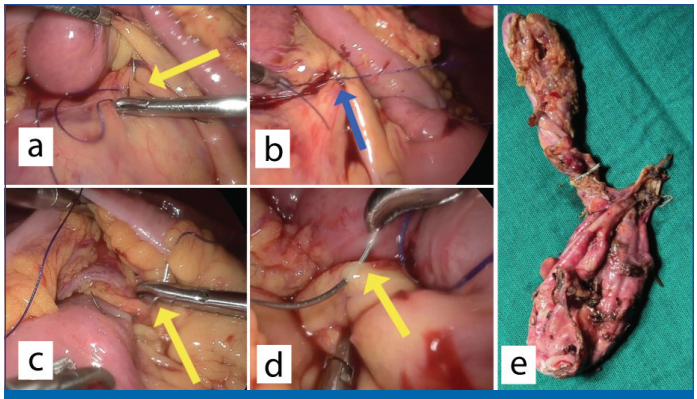


[Table/Fig-2]: a,b) Fashioning of Roux en Y loop (yellow arrows); c,d) Creation of window in transverse mesocolon (yellow arrows); e,f) Delivery of roux loop (red asterisks) thru the window (blue arrow).



[Table/Fig-3]: a) Jejunotomy made in the delivered roux loop(blue arrow); b-d) End to side bilioenteric anastomosis (yellow arrow); e,f) Stapled cum sutured jejuno-jejunostomy (yellow arrow).

GastroIntestinal Anastomosis (GIA) linear cutter and 2-0 Vicryl, about 40 cm distally [Table/Fig-3e,f]. The mesenteric defects, namely Peterson's defect, the transverse mesocolic defect, and the jejunojejunostomy defect, were meticulously suture-closed [Table/Fig-4a-d]. The specimen was retrieved in a bag, and a 32-Fr drain was left in situ to conclude the surgery [Table/Fig-4e]. Her immediate postoperative recovery was uneventful. She was started on oral feeds on Postoperative Day (POD) 3, and the drain was removed on POD 5. She was discharged from the hospital on POD 6. On her POD 10 follow-up visit, all her operative wounds had healed well. Her histopathology report revealed chronic cholecystitis with CC, with no evidence of neoplasia. At the time of writing this paper, a telephonic interview was conducted with the patient. Six months after her surgery, she remains asymptomatic.



[Table/Fig-4]: a,b) Suture closure of Peterson's defect(yellow & blue arrow); c) Suture closure of defect in transverse mesocolon (yellow arrow); d) Suture closure of jejuno-jejunostomy defect(yellow arrow); e)The specimen.

DISCUSSION

Biliary cysts, also known as CCs, are characterised by one or more dilations, typically involving the Common Bile Duct (CBD). They are congenital anomalies, causing varying degrees of expansion in the biliary tree, affecting both intrahepatic and extrahepatic areas, including the portion of the bile duct within the pancreas [1]. CCs are more common in females, with a female to male ratio of about 3:1. Around 80% of diagnoses are made in infants and young children, typically before the age of 10. This condition is particularly prevalent in East Asian populations [2]. While the precise cause of CC remains unclear, two main theories have been suggested. The first theory postulates that these cysts arise from congenital narrowing of the biliary tract. However, the more widely accepted explanation links the condition to an abnormal pancreatobiliary junction. An Anomalous Pancreaticobiliary Duct Union (APBDU) occurs when there is a failure in the migration of the choledochopancreatic junction into the duodenal wall, resulting in a longer common channel. A long common channel is defined as the bile duct entering the duodenum more than 15 mm beyond the ampulla of Vater. This elongated junction interferes with the function of the sphincter of the common bile duct (the sphincter of Boyden), permitting the backflow of duodenal contents into the biliary system. This backflow results in a cycle of ongoing inflammation, bile accumulation, elevated ductal pressure, and the formation of cysts. This phenomenon is seen in less than 2% of the population, though it is more frequent in paediatric CC cases [3]. Todani et al., in 1977 proposed the most widely used classification, based on the location of the cystic dilatation. The classification includes five types: Type I (the most common, 80-90% of cases), Type II, Type III, Type IV (accounting for 15-20% of cases), and Type V, also known as Caroli's disease [2]. Type I involves fusiform dilatations of the CBD, while type II represents true diverticula. Type III refers to choledochoceles, which are intraduodenal dilations of the common channel. Type IV A involves multiple intra and extra hepatic biliary dilations, while type IV B presents with only extrahepatic dilation. Type V (Caroli's disease) features cystic dilations only of the intrahepatic bile ducts [2]. Recently, new subdivisions have been introduced, including Type ID (or VIA) for dilation of the cystic duct in isolation, and Type VIB for cases in which both the cystic duct and the common bile duct are involved [4].

Choledochal cysts (CCs) are typically diagnosed in childhood, although prenatal detection and presentation in adults have been reported. Common presenting features include abdominal pain, jaundice, and a right upper quadrant mass, findings more frequently observed in children [5]. Adults often present with biliary or pancreatic related symptoms, along with abdominal discomfort. Biliary amylase levels may be elevated in CC. Patients with CC are

Sr. no	Surgery performed	Advantages	Disadvantages	Pioneer with the year of 1st performance
1	Cyst enterostomy	*Provides sufficient biliary drainage *Easier to perform	Extremely high rates of malignancy	
2	Choledochal Cyst (CC) excision with hepatico-duodenostomy with jejunal interposition or valved jejunal interposition	Avoids both biliary gastritis and malabsorption	Not widely performed/ explored	Golder McWhorter performed this procedure in 1924, modified further [11,12]
4	Open Choledochal Cyst (CC) excision with hepatico-jejunostomy	*Avoids chronic biliary tract inflammation *Reduced risk of cholangitis	*Malabsorption *Difficult to perform	Golder McWhorter, 1924 [12]
4.	Open Choledochal Cyst (CC) excision with hepatico-duodenostomy	*More physiological *Simpler to perform *Less operative time *Fewer rates of adhesive bowel obstruction, anastomotic leak, and peptic ulcer	*Biliary gastritis *Chances of developing hilar bile duct carcinoma	Alonso-Lej F et al., 1959 [13]
5.	Laparoscopic Choledochal Cyst (CC) excision with biliary drainage procedure	*Reduced length of hospital stay *Reduced rate of sepsis *Reduced recovery time *Reduced need for additional procedure *Reduced blood loss	*Longer learning curve *Longer operative time *Limited degree of movement and 2-dimensional view	Farello GA et al., 1995 [14]
6	Robotic Choledochal Cyst (CC) excision with biliary drainage procedure	*High-quality 3-dimensional view *More degree of freedom	Significantly longer operative time as compared to laparoscopic surgery	Woo R et al., 2006 [15]

[Table/Fig-5]: Summary of different surgical options for Type I CC [11-15].

at increased risk of complications such as biliary stones (occurring in 45-70% of cases) or acute cholecystitis, both consequences of bile stasis [6,7]. They are also more likely to have undergone prior biliary procedures, such as surgery or stenting. Diagnosis is generally confirmed using a combination of imaging modalities, including ultrasound, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and MRCP. Ultrasound, being cost-effective and readily accessible, is the most commonly employed modality, particularly in pediatric patients. In adults, a CBD diameter greater than 10 mm raises suspicion for cystic dilatation or obstructive biliary stones. Endoscopic ultrasound (EUS) is effective and safe for diagnosing CC, especially for detecting long common channels and choledochoceles, though ERCP remains the gold standard for these diagnoses [3]. ERCP and percutaneous transhepatic cholangiography are among the most sensitive methods for evaluating biliary anatomy; ERCP also offers therapeutic benefits, such as biliary drainage and endoscopic sphincterotomy. Noninvasive MRCP has gained popularity due to its high sensitivity (70-100%) and specificity (90-100%) in diagnosing CC and in classifying its types [7].

The differential diagnosis for CC includes biliary lithiasis, primary sclerosing cholangitis, pancreatic pseudocyst, biliary papillomatosis, and biliary hamartoma [8].

Surgical treatment of CCs has traditionally involved cystenterostomy, although this method is associated with a high rate of long-term complications, including stricture, jaundice, cholangitis, the need for repeat surgery, and a persistent risk of cholangiocarcinoma. While partial cyst excision or cystenterostomy can alleviate biliary obstruction, complete excision is necessary to minimise the risk of malignancy. The risk of malignancy varies with the type of CC, with Type I and IV-A associated with a higher likelihood of malignancy than Types II, III, or V [9]. As a result, the treatment approach must account for the type of cyst, the severity of symptoms, and the potential risk of malignancy. Surgery should be planned in a multidisciplinary setting.

Types II and III CCs are rarely malignant and are typically managed with diverticulectomy (Type II) and endoscopic sphincterotomy for choledochoceles. Large choledochoceles with complications may require transduodenal excision [8]. For Type V (Caroli's disease), treatment often involves liver resection or, in severe cases, orthotopic liver transplantation (OLT) [10]. Careful surgical resection is crucial to achieving favourable long-term outcomes. Different surgical options for Type I CC are summarised [Table/Fig-5] [11-15].

CONCLUSION(S)

Surgical management of Type I CC is feasible through minimal-access surgery in an advanced setting, which is ably complemented by a team with advanced laparoscopic surgical skills.

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PARTICULARS OF CONTRIBUTORS:
1. DNB 2nd Year Resident, Department of General Surgery, Dr. L H Hiranandani Hospital, Mumbai, Maharashtra, India.
2. Consultant, Department of General and Advanced Laparoscopic Surgery, Dr. L H Hiranandani Hospital, Mumbai, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Prachi Praveen Agrawal,
Dr. L H Hiranandani Hospital, Hillside Avenue, Powai, Mumbai-400076,
Maharashtra, India.
E-mail: prachiag1996@gmail.com

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