

## Laparoscopic Resection of Choledochal Cyst: Report of a Case

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### Abstract

We report a choledochal cyst that was successfully treated with laparoscopic surgery. A 32-year-old Japanese woman was referred to our hospital with a suspected choledochal cyst. Magnetic resonance cholangiopancreatography and computed tomography showed the common bile duct to be grossly dilated to the hepatic confluence. A diagnosis of type-Ia choledochal cyst in the Todani classification was made, and laparoscopic resection was performed. The patient was placed in the lithotomy position under general anesthesia, and 4 ports were inserted. After the cystic duct was dissected, the hepatoduodenal ligament was incised and a choledochal cyst was identified. Next, the common bile duct was mobilized and dissected away from the surrounding vessels and tissues. Taping of the common bile duct allowed better exposure and dissection of the surrounding tissues. Mobilization of the bile duct and dissection of the surrounding tissue was performed to the bifurcation of the common hepatic duct. Then the common hepatic duct was transected just distal to the choledochal cyst. The inferior common bile duct was dissected from the pancreas to identify the distal end of the choledochal cyst and the pancreaticobiliary junction behind the duodenum. The narrow segment of the choledochal cyst was identified and divided after distal closure with clips. After the gall bladder was dissected from the liver bed, the choledochal cyst and gallbladder were removed. A Roux limb was created extracorporeally via the umbilical incision. The jejunum 30 cm distal to the ligament of Treitz was removed through the transumbilical incision and transected. To create the Roux limb, the mesentery of the jejunum was also extracorporeally separated. A 50-cm Roux limb was made by means of side-to-side anastomosis with an endostapler. After a jejunostomy for hepaticojejunostomy anastomosis was created, the Roux limb was returned to the abdominal cavity. Then, pneumoperitoneum was started again, and the Roux limb was brought up laparoscopically in a retrocolic fashion. An end-to-side hepaticojejunostomy was intracorporeally established with a continuous, single-layer full-thickness 4-0 vicryl suture. Total operation time was 715 minutes. Intraoperative body fluid loss was 250 mL, and the postoperative course was uneventful with no major complications. The patient was discharged from hospital on the 12th postoperative day. She remains asymptomatic with normal liver function after 24 months of follow-up.

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**Key words:** choledochal cyst, laparoscopy

## Introduction

Choledochal cysts are congenital dilatations of the extrahepatic bile ducts, intrahepatic bile ducts, or both. Choledochal cysts are common in Asian populations and have the potential for malignant transformation and obstructive complications of the bile duct and pancreatic duct.

The standard treatment for choledochal cyst is complete excision of the cyst followed by biliary reconstruction. The complete excision of the choledochal cyst has historically been performed via open surgery. However, because of recent developments in laparoscopic instrumentation and improvements in surgical skill, laparoscopic surgery is suggested<sup>1</sup>.

We present a woman with a choledochal cyst who was treated with laparoscopic excision of the choledochal cyst and biliary reconstruction with a Roux-en Y hepaticojejunostomy.

## Case Report

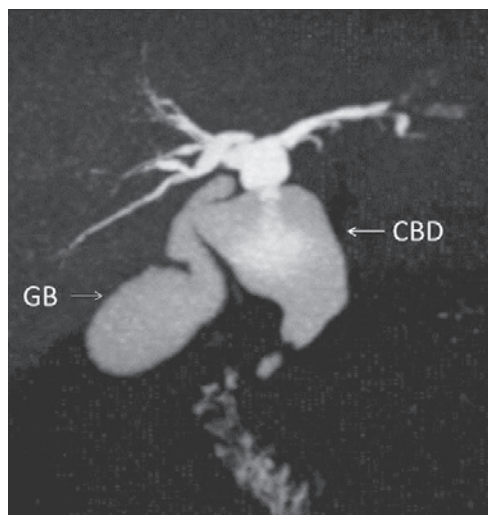
### Patient

A 32-year-old Japanese woman was referred to our hospital with a suspected choledochal cyst. She had had recurrent episodes of right lateral abdominal pain and fever. Magnetic resonance cholangiopancreatography (**Fig. 1**) and computed tomography showed the common bile duct to be grossly dilated to the hepatic confluence. No cystic dilation of the intrahepatic bile duct, isolated diverticulum of the common bile duct, or choledocholithiasis was demonstrated. Endoscopic retrograde cholangiopancreatography confirmed a long common channel. Physical examination was unremarkable. A diagnosis of type-Ia choledochal cyst in the Todani classification was made, and the patient underwent laparoscopic resection.

### Operation

The procedure was performed with the patient under general and epidural anesthesia.

The port position and team setup were as shown in **Figure 2**. The patient was placed in the lithotomy



**Fig. 1** Magnetic resonance cholangiopancreatography shows the common bile duct grossly dilated to the hepatic confluence. A diagnosis of type-Ia choledochal cyst in the Todani classification was established (CBD: common bile duct, GB: gallbladder).

position with the surgeon on the left side of the patient, and 4 ports were inserted. As an umbilical port, a surgical glove port<sup>2</sup> was used. Through a 3-cm transumbilical incision, a wound retractor (Alexis wound retractor XS, Applied Medical, CA, USA) and a surgical glove port with 12-mm trocars attached were inserted. A 12-mm umbilical trocar in the surgical glove port was used for the 10-mm flexible laparoscope.

First, the serosa of the gallbladder and the hepatoduodenal ligament were incised. The cystic duct and cystic artery were dissected. The cystic artery was identified to the junction with the right hepatic artery, double-clipped, and cut. The cystic duct was dissected to allow easier access to the common bile duct.

Next, the common bile duct was mobilized and dissected away from the portal vein and proper hepatic artery with hook cautery dissection. Taping of the common bile duct allowed better exposure and dissection of the surrounding vessels and tissue (**Fig. 3**). Mobilization of the bile duct and dissection of the surrounding tissue were performed to the bifurcation of the hepatic duct beyond the choledochal cyst. Then, the normal common hepatic duct was transected just distal to the dilated

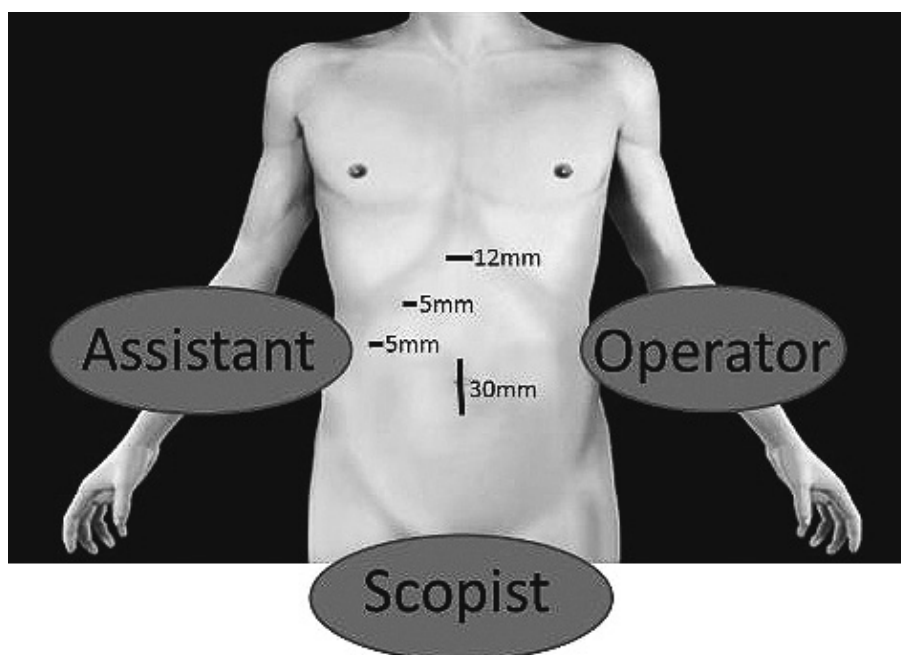


Fig. 2 Port position and team set-up.

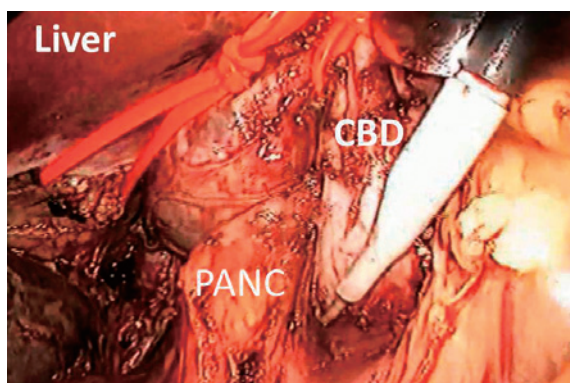


Fig. 3 Taping of the common bile duct allows better exposure and dissection of the surrounding vessels (CBD: common bile duct, PANC: pancreas).

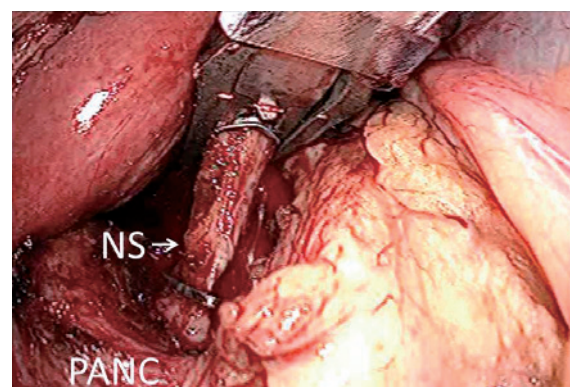


Fig. 4 The narrow segment of the choledochal cyst was identified and divided after distal closure with double clips (NS: narrow segment, PANC: pancreas).

choledochal cyst.

The common bile duct was then retracted to dissect the common bile duct from the pancreas. The duodenum and pancreas were also retracted downward with an endoscopic spacer (Securea, Hogy Medical Co. Ltd., Tokyo, Japan). The inferior common bile duct was dissected from the pancreas to identify the distal end of the choledochal cyst and the pancreaticobiliary junction behind the duodenum. The narrow segment of the choledochal cyst was identified and divided after distal closure with double clips (Fig. 4).

After the gall bladder was dissected from the liver bed, the choledochal cyst and gallbladder were removed through the umbilical port.

After the choledochal cyst was completely resected, hepaticojejunostomy with a Roux-en-Y loop was performed. The Roux limb was created extracorporeally via the umbilical incision. The jejunum 30 cm distal to the ligament of Treitz was removed through the transumbilical incision and transected with a stapler. To create the Roux limb, the mesentery of the jejunum was also extracorporeally separated with ultrasonic shears

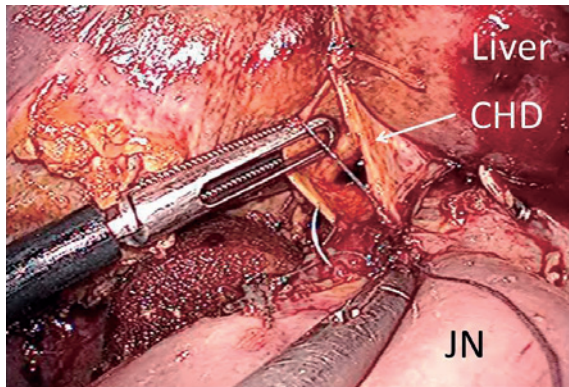


Fig. 5 An end-to-side hepaticojejunostomy was intracorporeally established with a continuous, single-layer, full-thickness 4-0 vicryl suture without a biliary stent or drainage (CHD: common hepatic duct, JN: jejunum).

(Harmonic Scalpel; Ethicon Endo-Surgery, Cincinnati, OH, USA). A 50-cm Roux limb was made by side-to-side anastomosis with an endostapler (Echelon Flex™ Endopath® Staplers; Ethicon Endo-Surgery). After a jejunotomy for hepaticojejunostomy anastomosis was created, the Roux limb was returned to the abdominal cavity. Then, pneumoperitoneum was started again, and the Roux limb was brought up in a retrocolic fashion.

An end-to-side hepaticojejunostomy was intracorporeally established with a continuous, single-layer full-thickness 4-0 vicryl suture without a biliary stent or drainage (**Fig. 5**).

Two closed suction drains were left behind and above the biliary anastomosis. Total operation time was 715 minutes. Intraoperative body fluid loss, including blood and bile juice, was 250 mL, and the patient required no intraoperative or postoperative blood transfusion.

The postoperative course was uneventful with no major complications. Oral fluid intake was started on the first postoperative day, and oral diet was started on the fourth postoperative day. On the 10th postoperative day, the intra-abdominal drain was removed. The patient was discharged on the 12th postoperative day. The pathological examination confirmed a choledochal cyst with no evidence of malignancy and indicated chronic cholecystitis.

The patient remains asymptomatic with normal

liver function at 24 months of follow-up.

## Discussion

The standard treatment for choledochal cyst was previously enteric drainage. However, patients with choledochal cysts are at high risk for gallbladder and bile duct cancers. Although the reason for the association of choledochal cysts and biliary cancer is unclear, suggested possible causes of carcinogenesis include reflux of pancreatic enzymes into the bile duct, bile stasis, and repeated infection. Complete resection of the choledochal cyst and gallbladder is recommended to decrease this malignant potential.

Recent developments in laparoscopic instrumentation and improvements in surgical skill have facilitated the adoption of minimally invasive surgery for the treatment of complex hepatobiliary conditions<sup>3-5</sup>. Several authors have described laparoscopic excision of choledochal cysts<sup>6-8</sup>. Because most choledochal cysts are diagnosed in children or young adults who are interested in good cosmetic results as well as cure of disease, laparoscopic excision of choledochal cysts is important for its cosmetic aspects and is an attractive treatment option.

The method of biliary construction associated with laparoscopic hepatobiliary surgery is an important problem that should be considered. At our institution, the Roux limb is created extracorporeally with a 3-cm-long umbilical incision. In ordinary laparoscopic surgery for choledochal cysts, a 2- to 3-cm-long umbilical incision is needed to insert the first port with the open method, and we also use this port to remove the resected choledochal cyst. We believe the incision can be used effectively for other extracorporeal procedures that can be approached from the port. Laparoscopic creation of the Roux limb is often performed with a mirror image and can be difficult for the surgeon. Because the 3-cm incision is large enough for treating the mesentery and the small intestine, this extracorporeal approach for creating a Roux limb is a more practical and reasonable method than is pure laparoscopic surgery.

Known complications of choledochal cyst excision

are bile leakage, cholangitis, anastomotic stricture, pancreatitis, and pancreatic fistula<sup>9,10</sup>. However, the incidence of these complications does not differ between laparoscopic excision and open excision of a choledochal cyst. Furthermore, blood loss is less and the risk of blood transfusion is lower with laparoscopic excision than with open surgery<sup>4</sup>. Laparoscopic surgery also has a magnifying effect on the surgical field which can be useful for reducing blood loss and for performing precise dissection of the common bile duct.

Our findings suggest that the laparoscopic approach for choledochal cysts is practical and less invasive and has cosmetic advantages. An increase in laparoscopic excisions of choledochal cysts and long-term follow-up data regarding complications and malignant transformation are needed for the further spread and improvement of this procedure.

### References

1. Shimura H, Tanaka M, Shimizu S, Mizumoto K: Laparoscopic treatment of congenital choledochal cyst. *Surg Endosc* 1998; 12: 1268–1271.
2. Hayashi M, Asakuma M, Komeda K, Miyamoto Y, Hirokawa F, Tanigawa N: Effectiveness of a Surgical Glove Port for Single Port Surgery. *World J Surg* 2010; 34: 2487–2489.
3. Chan ES, Auyang ED, Hungness ES: Laparoscopic management of a cystic duct cyst. *JLS* 2009; 13: 436–440.
4. Liuming H, Hongwu Z, Gang L, et al: The effect of laparoscopic excision vs open excision in children with choledochal cyst: a midterm follow-up study. *J Pediatr Surg* 2011; 46: 662–665.
5. Nakamura Y, Matsumoto S, Yoshioka M, Shimizu T, Yamahatsu K, Uchida E: Successful Laparoscopic Pancreaticoduodenectomy for Intraductal Papillary Mucinous Neoplasm: A Case Report and a Reliable Technique for Pancreaticojejunostomy. *J Nippon Med Sch* 2012; 79: 218–222.
6. Abbas HM, Yassin NA, Ammori BJ: Laparoscopic resection of type I choledochal cyst in an adult and Roux-en-Y hepaticojejunostomy: a case report and literature review. *Surg Laparosc Endosc Percutan Tech* 2006; 16: 439–444.
7. Gander JW, Cowles RA, Gross ER, et al: Laparoscopic excision of choledochal cysts with total intracorporeal reconstruction. *J Laparoendosc Adv Surg Tech A* 2010; 20: 877–881.
8. Jang JY, Kim SW, Han HS, Yoon YS, Han SS, Park YH: Totally laparoscopic management of choledochal cysts using a four-hole method. *Surg Endosc* 2006; 20: 1762–1765.
9. Tian Y, Wu SD, Zhu AD, Chen DX: Management of type I choledochal cyst in adult: totally laparoscopic resection and Roux-en-Y hepaticoenterostomy. *J Gastrointest Surg* 2010; 14: 1381–1388.
10. Srimurthy KR, Ramesh S: Laparoscopic management of pediatric choledochal cysts in developing countries: review of ten cases. *Pediatr Surg Int* 2006; 22: 144–149.

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