

# Laparoscopic resection of a choledochal cyst. Report of two cases and medium-term follow-up

*Resección laparoscópica de quiste de colédoco.  
Informe de dos casos con seguimiento a mediano plazo*

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**Keywords:**

Choledochal  
cyst, laparoscopic  
excision, laparoscopic  
bilioenteric  
anastomosis.

**Palabras clave:**

Quiste de  
coléodo, resección  
laparoscópica,  
anastomosis  
bilioentérica.

## ABSTRACT

**Introduction:** The first laparoscopic resection of a choledochal cyst was reported by Farello in 1995. Complete cyst resection with bilioenteric reconstruction is the established treatment of Todani I, II and IV-A choledochal cysts. The aim of this study is to present the clinical characteristics, the surgical technical details and the results obtained in two patients with choledochal cysts, as well as their fully laparoscopic management at our hospital. **Clinical cases:** Two females, aged 19 and 38 years, with the diagnosis of Todani I-C and I-B choledochal cysts. **Results:** Both procedures were laparoscopic, with transoperative bleeding of 600 ml and 350 ml respectively, and surgery durations of 390 and 340 minutes. Oral intake was resumed after 48 hours. Hospital stays were 5 and 6 days. There were no postoperative complications. The histopathology report described complete resection of the margins, with no evidence of malignant degeneration. A control magnetic resonance cholangiography at one month showed patency of the anastomosis. Maximum follow-up was 50 and 51 months, respectively. **Conclusions:** The presentation of these two cases underscores the feasibility of these procedures in our medical setting. We share the technical details of the laparoscopic surgical approach as a reference for other surgeons in the country.

## RESUMEN

**Introducción:** El primer reporte de resección laparoscópica fue realizado por Farello en 1995. La resección completa del quiste con reconstrucción bilioenterica es el tratamiento establecido para los quistes de coléodo Todani I, II y IV-A. Los objetivos de este trabajo son presentar las características clínicas, los detalles técnicos quirúrgicos y los resultados de dos pacientes con quiste de coléodo y su tratamiento completamente laparoscópico en nuestro hospital. **Casos clínicos:** Mujeres de 19 y 38 años de edad con diagnóstico de quiste de coléodo tipo Todani I-C y I-B. **Resultados:** Ambos procedimientos se realizaron de forma laparoscópica, con un sangrado transoperatorio de 600 ml y 350 ml, y un tiempo quirúrgico de 390 y 340 minutos. Se inició la vía oral a las 48 horas. La estancia hospitalaria fue de cinco y seis días. No hubo complicaciones postquirúrgicas. El reporte de histopatología describió bordes de resección completos, sin degeneración neoplásica. La colangiorresonancia de control al mes mostró viabilidad de la anastomosis. Se les dio un seguimiento máximo de 50 y 51 meses, respectivamente. **Conclusiones:** Con la presentación de estos dos casos resaltamos la factibilidad de realizar estos procedimientos en nuestro medio. Compartimos los detalles técnicos del abordaje quirúrgico laparoscópico para que sirvan de referencia para cirujanos nacionales.

## INTRODUCTION

Water first described choledochal cysts in 1723. This condition is three to four times more frequent in women than in men, and has the highest incidence in patients of Asian descent (one per 1,000 in Japan).

Only 20% of cases are seen in adults.<sup>1-3</sup> Its incidence in Western countries is between 1/100,000 and 1/150,000, and it is rare in our country.<sup>3</sup> The most accepted hypothesis on its pathogenesis is Babbitt's theory, published in 1969, suggesting an anomaly of the pancreaticobiliary junction.<sup>2</sup> In 1977,

**How to cite:** Crisanto-Campos BA, Trejo-Ávila ME, Arce-Liévano E, Moreno-Portillo M. Laparoscopic resection of a choledochal cyst. Report of two cases and medium-term follow-up. Cir Gen. 2018; 40(3): 200-205.

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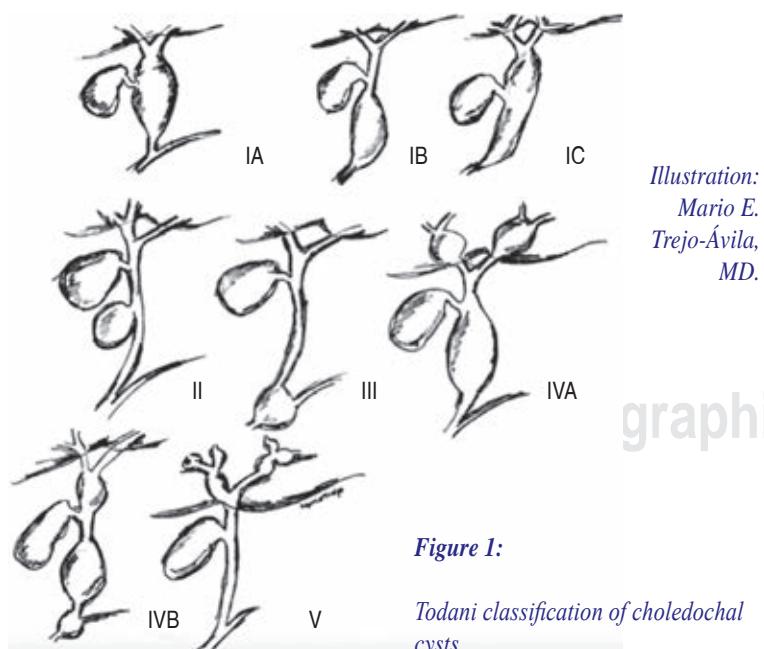
Mexico City, Mexico.

Received: 07/01/2017  
Accepted: 04/25/2018



Todani modified Alonso-Lej's classification, described in 1959; Todani's classification is the one most commonly used nowadays.<sup>1</sup> It divides choledochal cysts into five types (*Figure 1*): I, saccular dilation; II, choledochal diverticulum; III, choledochocele; IV-A, intra- and extrahepatic cysts; IV-B, multiple extrahepatic cysts; and V, intrahepatic cysts.<sup>1</sup> The main presenting symptoms are pain (87%), jaundice (57%), nausea, and vomiting. Less than 15% of cases show the classic symptom triad (pain, jaundice and tumor).<sup>4</sup> The study with the best diagnostic performance is cholangiography (either percutaneous, endoscopic or with magnetic resonance imaging).

Early surgical treatment is recommended due to the risk of choledocholithiasis (49%), cholangitis (32%), acute pancreatitis (10%), hepatolithiasis (7%), portal hypertension (2%), cholangiolar and hepatic abscesses, and cholangiocarcinoma (3%).<sup>2,4</sup> The first report of laparoscopic surgical management was published by Farello in 1995, on a 16 year-old patient.<sup>1</sup> Complete resection of the cyst and bilioenteric reconstruction (hepaticojejunral or hepatoduodenal anastomoses) is the established treatment for Todani I, II and IV-A choledochal cysts.<sup>2</sup>



The aim of this study is to describe the clinical characteristics, the technical details, and the immediate and medium-term follow-up results obtained in two patients with the diagnosis of adult choledochal cyst that were completely treated by laparoscopy at our hospital.

## CLINICAL CASES

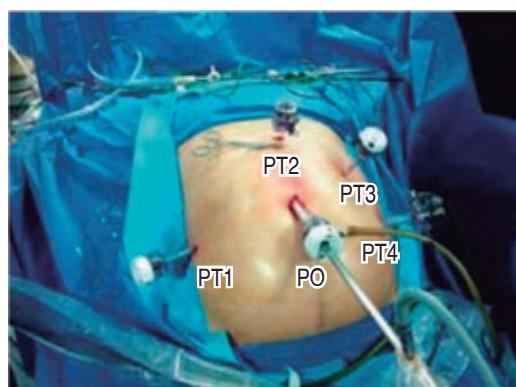
We present two patients with the diagnosis of choledochal cyst that was completely resolved by laparoscopic surgery and who were followed for 50 and 51 months, respectively.

### Preoperative phase

The first case was a 19-year-old woman, previously healthy, who presented with intermittent abdominal pain, jaundice and swelling in the right upper quadrant. The diagnosis of choledochal cyst was established by CT scan and corroborated by magnetic resonance cholangiography (MRC). The MRC reported a fusiform cystic dilation of the extrahepatic biliary tract, measuring 15.8 cm in length and 12.4 cm in width, associated to dilation of the intrahepatic biliary tract, no stenosis at the confluence of the hepatic ducts and no evidence of anomalies of the pancreaticobiliary junction. She was scheduled for surgery in June 2012.

The second case was a 38-year-old woman whose symptoms began one month prior to admission. She had a history of rheumatoid arthritis under treatment and three cesarean sections. She was admitted to the Emergency Department due to abdominal pain and jaundice. She required hospitalization, during which a choledochal cyst was diagnosed by CT scan. MRC showed dilation of the intrahepatic biliary tract, saccular dilation of the main biliary tract and no anomalies of the pancreaticobiliary junction. She was scheduled for surgery in July 2012.

Both patients were scheduled for elective surgery with prior night fast, mechanical thromboprophylaxis with compression stockings, and antibiotic prophylaxis with cefalotin, 1 g IV 30 minutes before the incision.



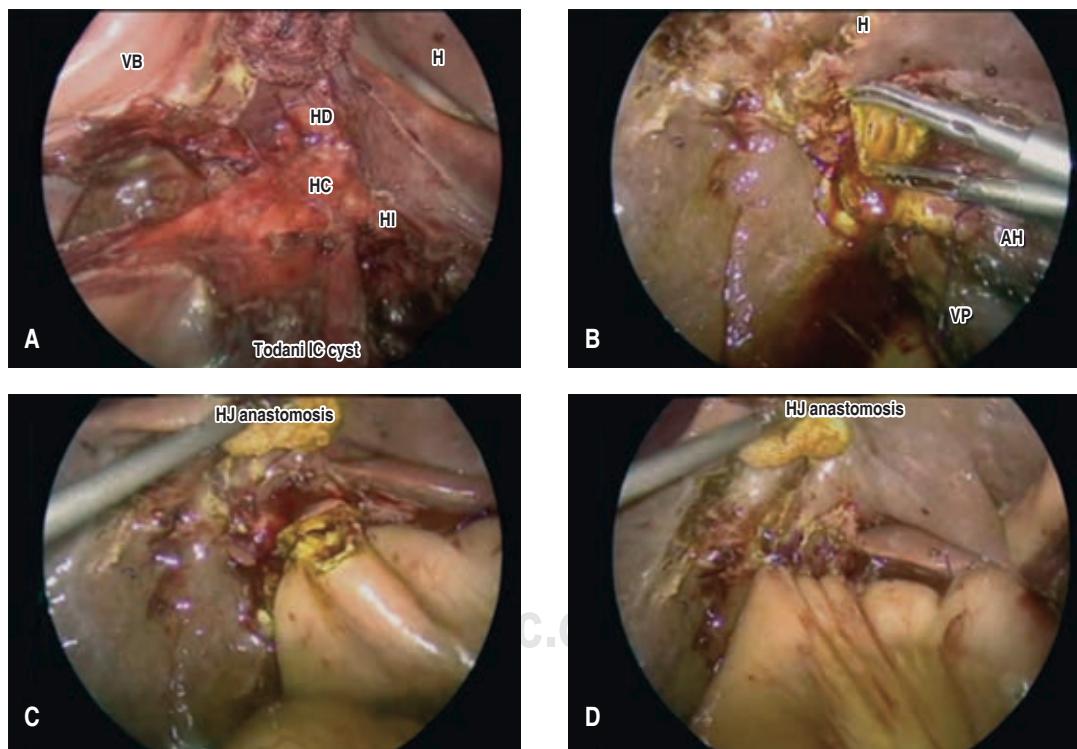
**Figure 2:** This image shows the distribution of the working ports (PT1-4) and the optical port (PO).

### Surgical technique

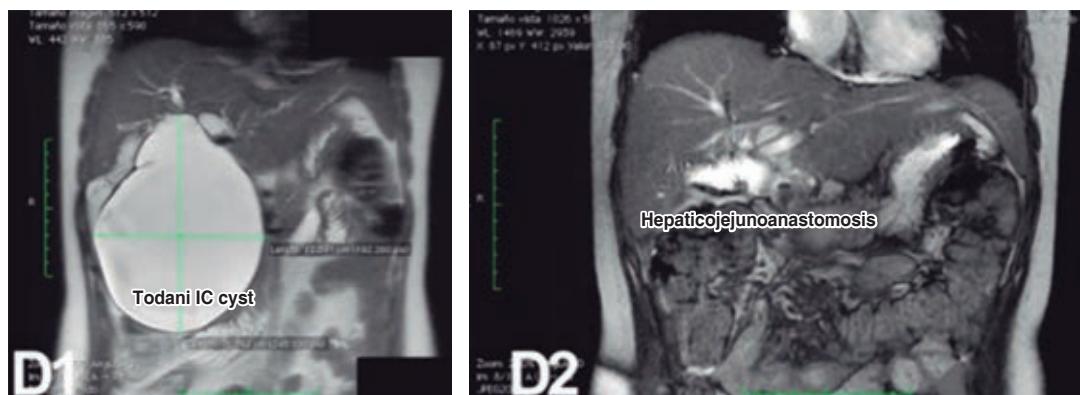
Both patients were placed in the French position, with the surgeon placed between the legs. In both cases, the pneumoperitoneum was insufflated (12 mmHg) with a Veress

needle through a transumbilical incision. This incision was used to place a 12-mm optic port. The procedure was performed with a 30 degree, 10-mm optical lens. In both cases, four working ports were placed (Figure 2). In both patients, a 1/4-inch Penrose was used for traction of the round ligament and exposure of the hepatic hilum.

*Dissection of the cyst.* In both cases, the duodenum was completely mobilized (extended Kocher maneuver) to expose the cyst. In the first patient, a Todani type I-C choledochal cyst was found, and in the second, a Todani I-B type cyst (Figure 3A). Dissection of the choledochal cyst was initiated on the anterior wall, then on the lateral wall and finally, on the posterior wall. Dissection was carried out in a blunt manner with a monopolar hook. The cyst was subsequently punctured and its contents emptied. Once collapsed, the medial wall was dissected away from the vascular structures (hepatic artery and portal



**Figure 3:** (A) Visualization of the gallbladder (GB), right hepatic duct (RHD), left hepatic duct (LHD), common hepatic duct (CHD) and cyst. (B) Sectioned cyst; the confluence of the biliary ducts may be seen. (C) Posterior wall of the hepaticojejunal (HJ) anastomosis. (D) Completed hepaticojejunal anastomosis.



**Figure 4:** Comparison of the magnetic resonance cholangiographies. **D1:** The Todani IC choledochal cyst is seen. **D2:** After surgery, the patent hepaticojejunostomy is seen.

vein). Dissection of the common bile duct was continued distally toward the retrooduodenal and intrapancreatic portions, until the non-dilated portion of the bile duct was identified; it was ligated proximally and distally with non-absorbable suture. It was then dissected toward the hilar plate and the cystic artery was ligated. In both cases, a cholecystectomy was performed. The confluence and the right and left hepatic ducts were then identified (*Figure 3B*).

The surgical specimens were removed (choledochal cyst and gallbladder). The next step was the construction of a Roux-en-Y anastomosis. A mechanical laterolateral jejunal anastomosis was created 70 cm from the duodenojejunal flexure. The loop was placed in a retrocolic position, and in both cases, the mesenteric gap was closed with 2-0 absorbable suture.

**Bilioenteric reconstruction** (*Figure 3 C-D*). A 2-cm terminolateral hepaticojejunal anastomosis was performed in a single plane, with intracorporeal suture technique and interrupted sutures, with a 4-0 monofilament absorbable suture. The anastomosis was started in the posterior wall and finished in the anterior wall.

Two Jackson-Pratt drains were placed, one in the Morrison's space and one in the pelvic cavity. A total bleeding of 600 ml was reported in the first procedure, and 350 ml in the second. Surgery durations were 390 and 340 minutes, respectively.

### Postoperative phase

Early ambulation was encouraged in both patients within the first 24 hours post-surgery. In both cases, oral intake was resumed 48 hours after the procedure, once intestinal function was restored (peristalsis and passage of gas). No early postoperative complications occurred in either patient, and drains were removed before hospital discharge. The patients remained in the hospital for 5 and 6 days, respectively. They were seen as outpatients 7 days after being discharged.

The two histopathology reports confirmed the diagnosis of choledochal cyst, both with complete margin resection; the second patient's gallbladder had cholesterolosis. There was no evidence of malignant degeneration in either case.

In the first case, a control MRC was performed one month after the surgical procedure, reporting adequate passage of bile to the Roux loop and no evidence of stenosis in the bilioenteric anastomosis (*Figure 4*). In the second case, an MRC was obtained at four months which reported no dilation of the intrahepatic biliary tract, a patent anastomosis and no leaks. The maximum follow-up period was 51 and 50 months, respectively. Both patients were seen as outpatients every three months during the first year and every six months during the second year. Hospital readmission, surgical or laparoscopic reinterventions were not required in either case.

## DISCUSSION

There are several case series on choledochal cysts in adults in Mexico,<sup>5,6</sup> even in pregnant women;<sup>7</sup> however, all have been treated with open surgery. In 2013, Jiménez-Urueta et al.<sup>8</sup> published a series of eight pediatric patients whose cysts were resected laparoscopically.

Initial comparative studies between open and laparoscopic surgery of choledochal cysts focused on determining the feasibility and safety of laparoscopic management. In 2014, a retrospective comparative study was published that included 35 patients operated laparoscopically and 39 that underwent open surgery. The laparoscopic procedure involved resecting the cyst and creating a hepaticojejunal anastomosis. Statistically significant differences were seen in the laparoscopy group regarding longer surgeries ( $p < 0.05$ ), less bleeding ( $p < 0.01$ ), earlier restoration of peristalsis ( $p < 0.01$ ), earlier reinitiation of oral intake ( $p < 0.01$ ) and a shorter hospital stay ( $p < 0.01$ ).<sup>4</sup>

A 2015 systematic review and meta-analysis included a total of seven studies ( $n = 1,408$ ). The authors found that, in spite of longer surgery durations in the laparoscopy group ( $p < 0.00001$ ), patients had a shorter hospital stay ( $p < 0.00001$ ) and recovered gastrointestinal function sooner ( $p < 0.00001$ ). There were no differences in terms of biliary leaks, postsurgical hemorrhage, stenosis of the anastomosis, the incidence of pancreatitis or the formation of postsurgical adhesions. Therefore, the study concluded that the laparoscopic approach was valid and safe.<sup>1</sup>

Some of the advantages that have been underscored by experienced authors include the magnified visualization of the surgical area and the easier identification and dissection of critical structures.<sup>9,10</sup> Choledochal cysts must be completely removed, just above the biliopancreatic confluence and five millimeters away from the confluence of the right and left hepatic ducts, to prevent complications resulting from any remnants.<sup>3</sup> If complete resection is not possible, the cyst's posterior wall may be fixed *in situ* by fulgurating the mucosa.<sup>2</sup> In the two

patients operated by our team, complete resection of the cysts was possible and was corroborated macroscopically during surgery and microscopically, according to the pathology results.

In 2015, Jang et al.<sup>3</sup> published a series of 82 patients who underwent laparoscopic resection. In their study, the mean surgery duration was 230 minutes, and mean intraoperative bleeding was 197 ml. Three procedures had to be converted to open surgery. Mean hospital stay was 8.6 days. The most frequent postoperative complications were biliary leak (7%) and collections (2.5%), and mean follow-up was 43 months. The results achieved in our two patients are similar to those reported in large series, i.e., our surgery durations and hospital stays were comparable, with a similarly low rate of medium-term complications.

A 2015 retrospective study included 110 patients treated laparoscopically (from 1998 to 2013), 55 of which were adults. In all adults, a Roux-en-Y hepaticojejunal anastomosis was carried out. Mean intraoperative bleeding was 76.55 ml and the mean duration of surgery was 251.6 minutes. Conversion to open surgery was required in three patients due to the presence of firm adhesions. Hospital stay was 7 days. Mean follow-up was 60 months, during which two adults developed cholangitis requiring reoperation; one patient died four months after surgery.<sup>2</sup>

To date, none of our patients has developed any serious complications, such as cholangitis or biliary leakage; however, the risk of stenosis of the bilioenteric anastomosis, with associated cholestasis and subsequent cholangitis, must be monitored with MRC and liver function tests.

Bilioenteric bypass carried out by minimally invasive procedures requires well-trained surgeons, with experience in endoscopic surgery. Although the functional results obtained with this technique are comparable to those obtained with open bypass, other benefits of the minimally invasive technique can be added (i.e., less postoperative pain, earlier recovery, and shorter hospital stay, among others).<sup>10</sup>

This manuscript is the report of two cases; there are several limitations inherent to this type of study.

## CONCLUSIONS

Choledochal cysts are a rare and infrequent condition in the adult Mexican population. Medical advances have made it possible to adapt minimally invasive surgeries to surgical procedures with high technical requirements. By presenting these two cases, we stress the feasibility of performing these procedures laparoscopically in our medical setting. We share the technical details of the laparoscopic surgical approach as a reference for other colleagues with experience in minimally invasive surgery throughout the country, since most laparoscopic series are from Asian institutions or in pediatric populations.

**Conflicts of interest:** The authors have no conflicts of interest to declare.

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