Original Article

Laparoscopic Hepaticoduodenostomy for Choledochal Cysts in Children <1 Year

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Abstract

Context: Choledochal cyst (CHC) is one of the most common causes of surgical jaundice in infants. In 1955, Farello *et al*. were the first to introduce the laparoscopic approach for treatment of CHC. **Aim of the Study:** Minimally invasive approaches to the management of CHC excision have been done in pre-schoolers and above but have not yet been described in toddlers, let alone infants. Herein, we review the results of 10 consecutive children <1 year managed with laparoscopic CHC excision and hepaticoduodenostomy. **Methods:** This retrospective study investigated 10 infants who underwent laparoscopic resection of a CHC with creation of a hepaticoduodenostomy. **Results:** This study was performed on 10 consecutive patients <1 year. Liver fibrosis was found in 4 patients. We had 7 cases with Type 1 CHCs and 3 cases with Type IV A cysts. Total cyst excision was done in all patients, no cases needed blood transfusion and the mean operative time was 200 min. The mean hospital stay was 6 days. Overall, morbidity occurred in 20% of the cases presenting with bouts of cholangitis that resolved without any intervention, once at 6 months, the other at 1-year post-operative. There were neither anastomotic strictures nor biliary fistula formation; magnetic resonance cholangiopancreatography was done to these two cases revealed no stricture and mortality at 30 and 90 days was nil. **Conclusion:** Laparoscopic hepaticoduodenostomy in CHC in children <1 year is safe, with satisfactory short-term results.

Keywords: <1 year, laparoscopic choledochal cyst, laparoscopic hepaticoduodenostomy

Introduction

Choledochal cyst (CHC) is one of the most common causes of surgical jaundice in infants. Surgical intervention is required for all patients and consists of radical excision of the cyst and the formation of either hepaticoduodenostomy or Roux and-Y hepaticojejunostomy.[1,2] In 1955, Farello *et al*.[3] were the first to introduce the laparoscopic approach for treatment of CHC.

Only few paediatric surgical centres published case series, due to rarity of these cases and technical difficulty in using minimal invasive surgery (MIS) in the management of CHC in children.[4,5] A slow learning curve was observed despite the vast experience of these centres with MIS techniques in children.[5,6]

The laparoscopic excision of antenatally-detected CHC has been reported, especially with advances in MIS and antenatal ultrasonography.[7,8] The best time for operation is still controversial, 3–6 months is recommended to minimise the risk of inflammation or even rupture of the cyst. The application of MIS in infants is safe and operations <3 months are feasible.[7,9]

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In this study, we review the results of 10 consecutive children <1 year diagnosed with CHC and laparoscopic CHC excision, and hepaticoduodenostomy was attempted in all cases.

Methods

This retrospective study was conducted at a tertiary referral university-based children hospital from March 2017 to March 2019. Before starting the treatment, informed consent was obtained from all the candidates' guardians, and ethical approval was obtained through the departmental research ethics and scientific committee.

Diagnosis of CHC was documented by history, clinical examination and right upper quadrant ultrasound (US) and/or magnetic resonance cholangiopancreatography (MRCP).

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Detailed history was taken, including mode of delivery, history of jaundice and presence or absence of discoloured stools. Clinical examination focused on signs of abdominal distension and hepatomegaly. Laboratory workup included liver function tests.

Four patients presented with obstructive jaundice. The other 6 patients were incidentally discovered on abdominal US, which revealed an abdominal liver cyst. Liver fibrosis was found in 4 patients. MRCP was performed in all patients to delineate the biliary and vascular anatomy and rule out other causes of obstructive jaundice such as tumours and bile duct stones, parasitological studies to rule out ascariasis.

We included in this study patients with age <1 year and 2 types of CHC (Type I and Type IV). We excluded other types of CHCs owing to the different management protocols.

Operative details

Pneumoperitoneum was obtained at 6–8 mmHg with a flow of 2 ml\min. Four ports were inserted. The first camera port was introduced through the umbilicus, the second port was inserted at the right midclavicular line, the third port was inserted at the left midclavicular line 2 cm above the umbilicus and the fourth port was placed below the xiphoid process to elevate the left lobe of the liver.

This manoeuver is especially useful in cases of hepatomegaly and to help adequate exposure of the duct distally. To achieve this, 2 transabdominal stitches were taken; one through the abdominal wall and fundus of the gallbladder to elevate the liver, another one was placed through the abdominal wall and the falciform ligament**,** identification and dissection of the cystic duct and artery were done routinely**,** mobilisation of the cyst was done using monopolar coagulation until a good visualisation of the common hepatic duct was obtained.

The confluence of the right and left hepatic ducts was exposed [Figure 1]. Resection of the cyst was made using monopolar coagulation by excision of the hepatic duct from the cyst with a maximal dissection of the distal part of the cyst up to the pancreas until tapering part of the cyst was achieved [Figure 2]. The proximal hepatic duct was flushed to clear up any potential protein plug, after revising the length of the hepatic duct remnant, mobilisation of the first part of duodenum was done in 4 cases, in all our cases, we performed hepaticoduodenostomy. The anastomosis was made with interrupted 5/0 absorbable sutures [Figures 3 and 4].

Results

A total of 10 children (6 girls and 4 boys) underwent laparoscopic resection of the CHC. The average age of the children was 6 months (range = 4–9 months), and we had 7 cases with Type I CHCs and 3 cases with a Type IV cyst according to Todani's classification. The average size of the cyst was 3 cm (range = 2.4–3.8). Total cyst excision was performed in all patients.

The average operative time was 200 min (range = 170–210). No cases were complicated by bile leakage or jaundice. Average length of hospital stay was 6 days (range = 4.5–8). The follow-up was 12 months. Liver fibrosis was found in 4 (40%) patients. We had 7 (70%) cases with Type 1 CHCs and 3 (30%) cases with Type IV A cysts.

Total cyst excision was done in all patients, no cases needed blood transfusion and the mean operative time was 200 min. The mean hospital stay was 6 days. Overall, morbidity occurred in 2 (20%) of the cases presenting with bouts of cholangitis that resolved on conservative management in the form of hospitalisation, nil-per-os and intravenous antibiotics and fluids, once at 6 months, the other at 1-year post-operative. There were neither anastomotic strictures nor biliary fistula formation; MRCP was done to these two cases revealed no stricture and mortality at 30 and 90 days was nil.

Discussion

The incidence of a CHC was 1 in 100,000–150,000 live births in Western countries[10] while 1 in 13,000 individuals in Japan.[4] In 85% of cases, CHC was diagnosed during the 1st year of life.

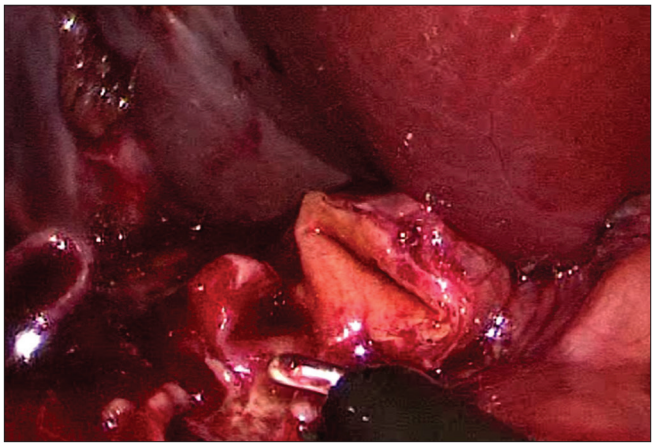

Figure 1: Common hepatic duct was incised at its bifurcation into the right and left lobular hepatic ducts

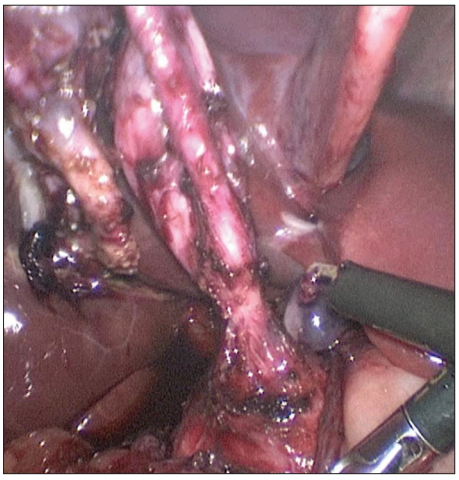

Figure 2: Maximal dissection of the distal part of the cyst up to the pancreas until tapering part of the cyst Type IV choledochal

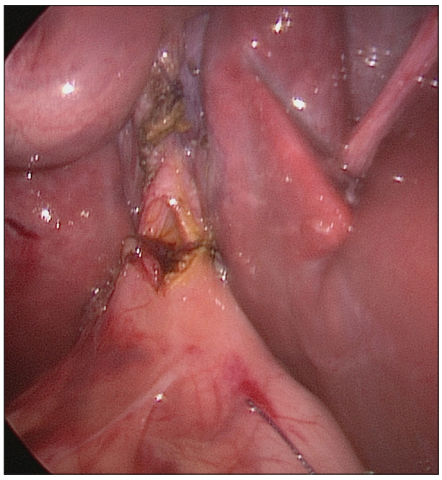

Figure 3: Hepaticoduodenostomy anastomosis was made with an interrupted 5/0 absorbable material. Posterior wall

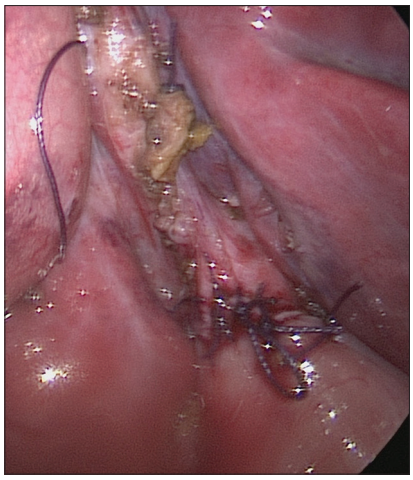

Figure 4: Hepaticoduodenostomy anastomosis was made with an interrupted 5/0 absorbable material after completion of anterior wall

Clinical presentation consists of a triad of symptoms: jaundice, pain in the right upper quadrant of the abdomen and presence of an abdominal mass.[11]

Godik *et al*.[12] had only one child who had all the symptoms of the triad. In three cases, the clinical presentation was abdominal pain and a cystic mass was localised at the hepatic helium on US. While in our series obstructive jaundice was found in 4 patients, the other 6 patients were incidentally discovered during an abdominal US that revealed an abdominal cyst. Diao *et al*.[13] reported CT and MRCPs that are diagnostic methods in all of their cases. Not only to confirm the diagnosis and determine what type of CHC but also to detect the relationship between the cyst itself and other neighbouring anatomical structures, thus, increasing the efficacy of surgical treatment and lessens intra-operative complications. Notably, in this study, we performed abdominal US and MRCP in all of our cases.

Godik *et al*.[12] put 4 criteria to do laparoscopic hepaticoduodenostomy. Specifically, cysts size <3 cm, site of the cyst in the distal part of the common bile duct and length of the remnant of the hepatic duct after cyst excision not <1 cm with distance to the duodenum not more than 1.5 cm after its mobilisation. In other cases, the biliodigestive reconstruction was performed by a Roux en-Y hepaticojejunostomy, while in our study, we did not find any problems in doing laparoscopic hepaticoduodenostomy in any of our young patients aged <1 year.

Chan *et al*.[9] had one case of biliary leakage and no cholangitis. In our series, we had 2 cases that suffered from post-operative attacks of cholangitis.

Chan *et al*.[9] suggested that the laparoscopic excision of antenatal-detected CHCs can be performed safely at 3 months of age, while in this study, mean age of our cases was 6 months. Nonetheless, we also suggest that early operation of these cases may reduce the risk of cholangitis and minimise difficulty during surgery.

Conclusion

Laparoscopic CHC excision, hepaticoduodenostomy, is safe and quickly performed for children <1 year, with satisfactory short-term results. The risk of cholangitis was reduced when these operations were done earlier, thus minimise intra-operative and post-operative complications.

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Conflicts of interest

There are no conflicts of interest.

References

1. Alonso-Lej F, Rever WB Jr., Pessagno DJ. Congenital choledochal cyst, with a report of 2, and an analysis of 94, cases. Int Abstr Surg 1959;108:1-30.
2. Todani T, Watanabe Y, Toki A, Hara H. Hilar duct carcinoma developed after cyst excision followed by hepaticoduodenostomy. In: Koyanagi Y, Aoki T, editors. Pancreaticobiliary Maljunction. Tokyo, Japan: Igaku Tosho Shuppan; 2002. p. 17-21.
3. Farello GA, Cerofolini A, Rebonato M, Bergamaschi G, Ferrari C, Chiappetta A. Congenital choledochal cyst: Video-guided laparoscopic treatment. Surg Laparosc Endosc 1995;5:354-8.
4. Liem NT, Pham HD, Dung le A, Son TN, Vu HM. Early and intermediate outcomes of laparoscopic surgery for choledochal cysts with 400 patients. J Laparoendosc Adv Surg Tech A 2012;22:599-603.
5. Wang B, Feng Q, Mao JX, Liu L, Wong KK. Early experience with laparoscopic excision of choledochal cyst in 41 children. J Pediatr Surg 2012;47:2175-8.
6. Diao M, Li L, Cheng W. Laparoscopic versus open Roux-en-Y hepatojejunostomy for children with choledochal cysts: Intermediate-term follow-up results. Surg Endosc 2011;25:1567-73.
7. Diao M, Li L, Cheng W. Timing of surgery for prenatally diagnosed asymptomatic choledochal cysts: A prospective randomized study. J Pediatr Surg 2012;47:506-12.
8. Matsumoto M, Urushihara N, Fukumoto K, Yamoto M, Miyake H, Nakajima H. Laparoscopic management for prenatally diagnosed choledochal cysts. Surg Today 2016;46:1410-4.
9. Chan KW, Lee KH, Tsui SY, Mou JW, Tam YH. Laparoscopic management of antenatally detected choledochal cyst: A 10-year review. Surg Endosc 2016;30:5494-9.

10. Hung MH, Lin LH, Chen DF, Huang CS. Choledochal cysts in infants and children: Experiences over a 20-year period at a single institution. Eur J Pediatr 2011;170:1179-85.
11. Park SW, Koh H, Oh JT, Han SJ, Kim S. Relationship between anomalous pancreaticobiliary ductal union and pathologic inflammation of bile duct in choledochal cyst. Pediatr Gastroenterol Hepatol Nutr 2014;17:170-7.
12. Godik O, Prytula V, Soroutchan V, Dubrovin A. Laparoscopic treatment of congenital choledochal cysts in children. Acad J Ped Neonatal 2018;7:555759. doi: 10.19080/AJPN.2018.07.555759.
13. Diao M, Li L, Cheng W. Role of laparoscopy in treatment of choledochal cysts in children. Pediatr Surg Int 2013;29:317-26.