Laparoscopic repositioning of an aberrant right hepatic artery and hepaticojejunostomy for pediatric choledochal cyst: A case report

Ryuta Masuya a,1, Kina Miyoshi b,2, Kazuhiko Nakame a,1, Atsushi Nanashima c,1, Satoshi Ieiri d,*

a Division of the Gastrointestinal, Endocrine and Pediatric Surgery, Department of Surgery, Faculty of Medicine, University of Miyazaki, Miyazaki, Japan
b Department of Pediatric Surgery, Miyazaki Prefectural Miyazaki Hospital, Miyazaki, Japan
c Division of Hepato-Biliary-Pancreatic Surgery, Department of Surgery, Faculty of Medicine, University of Miyazaki, Miyazaki, Japan
d Department of Pediatric Surgery, Research Field in Medical and Health Sciences, Medical and Dental Area, Research and Education Assembly, Kagoshima University, Kagoshima, Japan

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ABSTRACT

Introduction: The right hepatic artery crossing the ventral side of the common hepatic duct is a relatively frequent abnormality. This aberrant right hepatic artery not only interferes with dissection of the common bile duct and hepaticojejunostomy for choledochal cyst but can also cause postoperative anastomotic stenosis.

Case presentation: A 14-year-old patient presented with upper abdominal pain and was diagnosed with a choledochal cyst (Type IVA in Todani Classification) and pancreaticobiliary maljunction. Abdominal enhanced computed tomography showed aberrant right hepatic artery located at the ventral side of the common hepatic duct. Laparoscopic choledochal cyst resection and hepaticojejunostomy were planned. Intraoperative findings also showed the aberrant right hepatic artery crossing the common hepatic duct ventrally as detected on preoperative computed tomography. Laparoscopic dorsal side repositioning of the aberrant right hepatic artery was performed because it appeared to compress the common hepatic duct and risked causing postoperative anastomotic stenosis. We performed laparoscopic hepaticojejunostomy by replacing the aberrant right hepatic artery dorsally to facilitate suturing and prevent postoperative anastomotic stenosis. The postoperative course was uneventful, with no findings suggestive of anastomotic stenosis.

Discussion: The abnormality of the right hepatic artery is reported to be a primary cause of anastomotic stenosis after hepaticojejunostomy. Once anastomotic stenosis or stricture develops, it is often difficult to treat. The prevention of the stenosis is important.

Conclusions: In choledochal cyst with aberrant right hepatic artery, dorsal repositioning is effective for preventing postoperative anastomotic stenosis and cholestasis.

1. Introduction

The right hepatic artery crossing the anterior aspect of the common hepatic duct (CHD) is a relatively frequent abnormality [1]. Aberrant right hepatic artery (ARHA) not only interferes with dissection of the CHD and suturing for hepaticojejunostomy in choledochal cyst but can also cause postoperative anastomotic stenosis [2].

We describe our surgical technique for replacing the ARHA dorsally in hepaticojejunostomy to prevent anastomotic stenosis during laparoscopic resection and hepaticojejunostomy of a choledochal cyst in a pediatric patient.
2. Case presentation

A 14-year-old patient was diagnosed with a choledochal cyst. At 13 years old, the patient had visited the previous doctor for upper abdominal pain. Acute pancreatitis was suspected due to high levels of serum amylase on blood biochemical tests. Plain computed tomography (CT) of the abdomen showed dilatation of the common bile duct (CBD), CHD, and intrahepatic biliary ducts (Fig. 1a). The abdominal symptoms and hyperamylasemia resolved within a few days by conservative therapy. Magnetic resonance cholangiopancreatography performed after abdominal symptoms resolved revealed pancreaticobiliary maljunction (Fig. 1b). The patient was referred to our institution for further treatment. Repeat abdominal enhanced CT showed an ARHA located at the ventral side of the CHD (Fig. 1c). With a diagnosis of choledochal cyst, the patient was referred to our institution for further treatment. Repeat abdominal enhanced CT showed an ARHA located at the ventral side of the dilated common hepatic duct.
the patient, with trocars placed as follows: 10 mm 30◦ laparoscope inserted via 12-mm trocar at the umbilicus, operator's left hand (5 mm) at the right upper abdomen, operator's right hand (5 mm) at the right side of the umbilicus, assistant's left hand (5 mm) at the left lateral abdomen, and a 2.4-mm percutaneous needle-type grasper at the left upper abdomen for gallbladder retraction. The intraoperative findings showed that the ARHA crossed at the ventral side of the dilated CHD (Fig. 2a). After dissection of the CBD using a vessel sealing system (EnSeal X1; Ethicon, Cincinnati, OH, USA), CBD transection was performed just above the joint portion of the CBD and pancreatic duct with confirming intraoperative cholangiography (Fig. 2b). After dissecting the ARHA, tapering was performed (Fig. 2c, Video S1). Laparoscopic dorsal-side repositioning of the ARHA was performed because it seemed to compress the CHD and risked causing postoperative anastomotic stenosis (Fig. 2d). We performed laparoscopic hepatojejunostomy by replacing the ARHA dorsally to facilitate suturing and prevent postoperative anastomotic stenosis (Fig. 3). After finishing anastomosis, the beating of the repositioned ARHA was recognized, confirming that blood flow was maintained. We placed a drain dorsally to the anastomosis.

Postoperatively, the patient showed no anastomotic leakage. We removed the drain on postoperative day 5 after confirming a decrease in drainage volume. We administered antibiotics CPZ/SBT intravenously for 7 days postoperatively. The patient was discharged on postoperative day 11. During the 5-month postoperative follow-up period, there was no elevation of serum bilirubin levels or dilatation of the intrahepatic bile ducts on abdominal ultrasonography suggestive of anastomotic stenosis.

3. Discussion

There are many anatomical variations in the right hepatic artery, with the artery crossing on the ventral side of the extrathepatic bile duct being a relatively frequent anomaly [1]. Vascular compression in the proximal CHD can be a congenital cause of obstructive jaundice. Some reports [1,3] have shown that the CHD can be compressed by abnormalities of the celiac and gastroduodenal arteries as well as ARHA.

Todani first reported the technique of placing the ARHA behind the CHD to restore a normal anatomy [4]. Lal reported that in 12.8% (15/117) of children with choledochal cyst, the ARHA crosses the anterior wall of the CHD [5]. These arteries were repositioned at the posterior side of the hepatojejunostomy to restore a normal anatomy.

Diao reported cases in which the ARHA was replaced dorsally during laparoscopic redo hepatojejunostomy [2]. They also mentioned that the ARHA crossed anteriorly to the proximal CHD in a high percentage of patients with postoperative recurrent biliary obstruction (7/30, 23.3%). They found that abnormality of the RHA was a primary cause of anastomotic stenosis after hepatojejunostomy. Furthermore, they speculated that there were two potential causes of choledochal cyst: (1) Before surgery, the intraductal pressure of the dilated biliary system resists compression by the ARHA, and postoperatively, the dilatation of the biliary system is resolved, so the compression of the artery on the proximal CHD worsens; (2) the site of hepatojejunostomy is close to the ARHA, and during the wound healing process, the artery may cause compression by the inflammatory edematous CHD, resulting in stenotic changes in the lumen.

Once anastomotic stenosis or stricture develops, bile stasis becomes apparent, sometimes causing cholangitis and leading to the formation of intrahepatic stones. Liver damage due to bile stasis may eventually lead to liver fibrosis and cirrhosis. However, once anastomotic stenosis occurs in hepatojejunostomy, it is difficult to treat. In cases with intrinsic anastomotic stricture, percutaneous transhepatic cholangiopancreatography (PTCD) and balloon dilation of the anastomosis can improve the stenosis but induce prolonged tube placement, leading to cholangitis, bile stasis, and inflammatory stenosis of the bile duct at the drain placement site [6,7]. Ono et al. reported the management of postoperative intrahepatic stones using double-balloon enterotomy (DBE) [8], which can be applied to anastomotic stenosis; DBE can be less invasive than reoperation or PTCD. However, for anastomotic stenosis due to extrinsic factors, such as ARHA, these interventions have not proven effective, but palliative treatment. Initial judgment concerning the need to reposition the ARHA is important for laparoscopic choledochal cyst resection and hepatojejunostomy. The decision should be based on intraoperative findings, such as the branching configuration of the ARHA.

4. Conclusions

We encountered a case of a choledochal cyst with ARHA in which the artery was replaced dorsally at the anastomosis during laparoscopic choledochal cyst resection and hepatojejunostomy. In surgery for choledochal cyst with ARHA, replacing the artery to the dorsal side of the anastomosis is essential for preventing postoperative extrinsic anastomotic stenosis.

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List of abbreviations

ARHA aberrant right hepatic artery
CBD common bile duct
CHD common hepatic duct
CT computed tomography

Declaration of competing interest

All authors declare that they do not have any conflicts of interest.

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Ethical approval

All procedures used in this research were approved by the Ethical Committee of Miyazaki University Hospital.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Ryuuta Masuya wrote the initial draft of the manuscript. All other authors contributed to data collection and interpretation and critically reviewed the manuscript. All authors approve the final version of the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
Registration of research studies

This case is registered in National Clinical Database; the major database of surgical case in Japan.

Guarantor

Satoshi Ieiri has accepted full responsibility for this work and the decision to publish it.

References

[1] R. Tsuchiya, T. Eto, N. Harada, K. Yamamoto, T. Matsumoto, T. Tsunoda, et al., Compression of the common hepatic duct by the right hepatic artery in intrahepatic gallstones, World J. Surg. 8 (1984) 321–326, https://doi.org/10.1007/bf01655064.

[2] M. Diao, L. Li, W. Cheng, Recurrence of biliary tract obstructions after primary laparoscopic hepaticojejunostomy in children with choledochal cysts, Surg. Endosc. 30 (2016) 3910–3915, https://doi.org/10.1007/s00464-015-4697-5.

[3] Y.H. Baek, S.R. Choi, J.H. Lee, M.J. Kim, Y.H. Kim, Y.H. Roh, et al., Obstructive jaundice due to compression of the common bile duct by right hepatic artery originated from gastroduodenal artery, Korean J. Gastroenterol. 52 (2008) 394–398.

[4] T. Todani, Y. Watanabe, A. Toki, K. Ogura, Z.Q. Wang, Co-existing biliary anomalies and anatomical variants in choledochal cyst, Br. J. Surg. 85 (1998) 760–763, https://doi.org/10.1046/j.1365-2168.1998.00697.x.

[5] R. Lal, A. Behari, R.H. Hari, S.S. Sikora, S.K. Yachha, V.K. Kapoor, Variations in biliary ductal and hepatic vascular anatomy and their relevance to the surgical management of choledochal cysts, Pediatr. Surg. Int. 29 (2013) 777–786, https://doi.org/10.1007/s00383-013-3333-5.

[6] N. Urushihara, K. Fukumoto, H. Fukuzawa, M. Mitsunaga, K. Watanabe, T. Aoba, et al., Long-term outcomes after excision of choledochal cysts in a single institution: operative procedures and late complications, J. Pediatr. Surg. 47 (2012) 2169–2174, https://doi.org/10.1016/j.jpedsurg.2012.09.001.

[7] S. Nennstiel, A. Weber, G. Frick, B. Haller, A. Meining, R.M. Schmid, et al., Drainage-related complications in percutaneous transhepatic biliary drainage: an analysis over 10 years, J. Clin. Gastroenterol. 49 (2015) 764–770, https://doi.org/10.1097/mcg.0000000000000275.

[8] S. Ono, K. Maeda, K. Baba, Y. Usui, Y. Tsuji, T. Yano, et al., The efficacy of double-balloon enteroscopy for intrahepatic bile duct stones after roux-en-Y hepaticojejunostomy for choledochal cysts, Pediatr. Surg. Int. 29 (2013) 1103–1107, https://doi.org/10.1007/s00383-013-3376-7.

[9] for the SCARE Group, R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.