Hepaticoduodenostomy as a technique for biliary anastomosis in children with choledochal cyst: an experience with 31 cases

Nandita A. Saxena, Bharati K. Kulkarni, Shyam S. Borwankar, Hemant N. Lahoti, Pooja Multani and Sanjay N. Oak

Objective **The aim of this study was to investigate the efficacy and complications of hepaticoduodenostomy in the treatment of choledochal cyst in children.**

Summary background data **The conventional treatment of choledochal cyst includes Roux-en-Y hepaticojejunostomy for biliary reconstruction. This procedure, however, disrupts normal bowel continuity and requires two anastomoses. We studied the technique of hepaticoduodenostomy as an effective alternative to this technique.**

Patients and methods **A total of 31 children undergoing hepatoduodenostomy for choledochal cyst over a period of 9 years were included in this study.**

Results **The patients operated upon had outcomes similar to those treated by the Roux-en-Y technique in other studies.**

Conclusion **Hepaticoduodenostomy is an effective alternative to the conventional Roux-en-Y anastomotic technique in cases of choledochal cyst in children.** ***Ann Pediatr Surg*** **13:78–80 © 2017 Annals of Pediatric Surgery.**

Annals of Pediatric Surgery 2017, **13**:78–80

Keywords: choledochal cyst, hepaticoduodenostomy, pediatric

Department of Pediatric Surgery, D.Y. Patil Hospital, Navi Mumbai, Maharashtra, India

Correspondence to Nandita A. Saxena, MCh, Department of Pediatric Surgery, D.Y. Patil Hospital, Sector 5, Nerul, Navi Mumbai 400706, Maharashtra, India
Tel: + 022 27735901; e-mail: drnanditasaxena@gmail.com

Received 27 August 2016 **accepted** 27 October 2016

Introduction

Choledochal cyst is one of the most common congenital biliary tract anomalies. As per Todani's classification, types 1 and 4A are treated with excision and biliary tract reconstruction. Roux-en-Y hepaticojejunostomy has been the conventional reconstruction technique described in the literature. Hepaticoduodenostomy is a viable alternative to this technique. We retrospectively studied our pediatric patients who underwent this procedure over a 9-year period to determine the efficacy of this technique.

Aims and objectives

(1) To study the efficacy of hepaticoduodenostomy as a technique of biliary reconstruction after excision of choledochal cyst.
(2) To assess the early and late complications of hepaticoduodenostomy.
(3) To assess the factors that may prevent complications of this technique.
(4) To study the epidemiology of our patients with choledochal cyst.

Inclusion criteria

All patients in the age group of 0–12 years diagnosed with choledochal cyst were eligible for this study.

Patients and methods

The procedure, including obtaining informed consent, was conducted in accord with the ethical standards of the Committee on Human Experimentation of the institution. All pediatric patients aged 0–14 years with choledochal cyst undergoing surgery in the Pediatric Surgery Department of this Tertiary Care Institute during the period 2007–2016 were included in the study.

Preoperatively, the anatomical details of the biliary tree were delineated using a contrast-enhanced computed tomographic scan of the abdomen.

The children who presented with cholangitis were initially treated for the same, followed by surgery after 2–3 weeks of completion of antibiotic course.

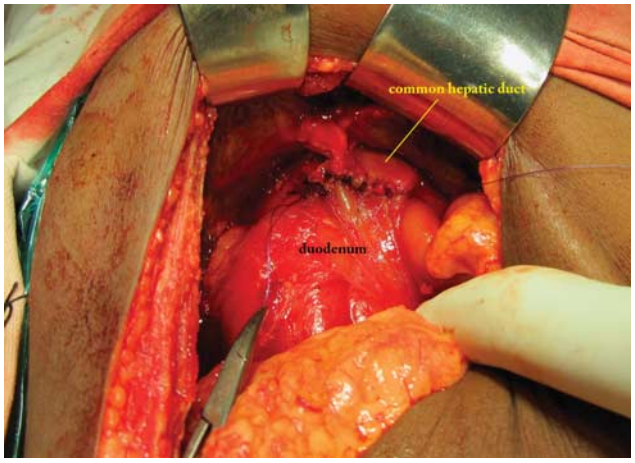
Intraoperatively, all patients underwent open repair with a right subcostal incision. The gall bladder was initially dissected up to Calot's triangle. The choledochal cyst was mobilized all around and its lower end was disconnected. Proximal dissection was done until the upper limit of the cyst or the confluence of the hepatic ducts, followed by excision of the cyst.

In the cases where the posterior wall of the cyst was densely adhered to the portal vein, Lilly's procedure was performed, excising the mucosa of the posterior cyst wall completely.

The duodenum was kocherized and opened at the junction of the first and second part in the superolateral wall. The anastomosis was done in a single layer, starting posteriorly, wherein continuous sutures were taken with delayed absorbable suture material. The anterior layer was completed using interrupted sutures with the knots outside (Fig. 1).

1687-4137 © 2017 Annals of Pediatric Surgery DOI: 10.1097 /01.XPS.0000508440.37104.0d

Fig. 1



Photograph of the completed anastomosis.

Care was taken to ensure that the anastomosis was wide and not under any tension.

The abdomen was closed over a drainage tube and a Ryle's tube in the stomach.

Postoperatively, the patients were started on feeds on the fifth or sixth postoperative day when Ryle's tube outputs decreased. The intra-abdominal drains were removed within a week and the patients were discharged by about the 9th or 10th day with sutures removed.

The follow-up protocol included assessment of symptoms, and investigation with liver function test and an ultrasound of the abdomen at 2, 6 months, and then yearly for all patients.

Results

A total of 31 patients were operated upon, of whom 22 (71%) were girls and nine (29%) were boys. The youngest patient operated upon was 1 year old; the mean age of patients at surgery was 6 years.

In all, 11 (35.4%) patients presented with cholangitis; 20 (64.5%) patients presented with an incidental diagnosis for vague complaints of abdominal pain for which ultrasound of the abdomen was performed, revealing a choledochal cyst. None of the patients had an abdominal lump.

At surgery, 28 (90.3%) patients underwent complete excision and three (9.7%) patients underwent Lilly's procedure.

The average duration of surgery was 2.3 h.

One patient was detected to have an accessory right hepatic duct arising from the common hepatic duct during surgery. This was managed with a wide anastomosis with inclusion of the insertion site of this duct. There were no postoperative complications.

One patient developed an anastomotic leak. This was a delayed leak detected on the 10th postoperative day. It was initially conserved but the child was finally re-explored. At surgery, a minor leak (3–4 mm) was noticed in the anterior wall of the anastomosis, which was resutured. The child had an uneventful recovery.

The mean time of starting feeds was the fifth postoperative day.

The average time of drain removal was the sixth postoperative day. Two patients required prolonged drain placement due to serous discharge, which gradually subsided (10 and 11 days). These were among the patients who had suffered prior attacks of cholangitis.

The average length of postoperative hospital stay was 8.5 days.

The patients are on regular follow-up and none of them have suffered from any complications to date.

Discussion

Total excision of the cyst in types 1 and 4A followed by reconstruction of the biliary tree with hepaticojejunostomy in a Roux-en-Y manner has been widely accepted as the procedure of choice in treating choledochal cysts [1].

Several studies have supported the use of hepaticoduodenostomy as an alternative to this technique in the recent literature [2–4].

There are advantages and disadvantages to both these procedures.

The Roux-en-Y hepaticojejunostomy requires two anastomoses, takes a longer time, and makes postoperative endoscopic stenting, if required, impossible. A relatively long (40 cm) segment of the jejunum is defunctionalized. Many studies have shown that the complications include anastomotic leak, cholangitis, and fluid collection in the gall bladder fossa in the early postoperative period; late complications include anastomotic stricture, cholangitis, and biliary stone formation [5].

Hepaticoduodenostomy solves some of these limitations. It maintains the normal bowel continuity, takes less time, and is less tedious because of the requirement of a single anastomosis only. As it is more physiological, we feel that the incidence of postoperative adhesive intestinal obstruction is less and endoscopic stenting if needed is possible.

The mean duration of surgery in our series was about 2 h 30 min. The surgical time was longer in the cases that had dense periportal adhesions (four patients) and congenital biliary anomalies (one patient). The bilioenteric anastomosis was completed quickly and hence helped to decrease the operative time. This is in comparison with the Roux-en-Y hepaticojejunostomy requiring two anastomoses [6].

Shimotakahara *et al.* [7] reported that the incidence of postoperative endoscopy-proven biliary gastritis is greater in patients who have undergone hepaticoduodenostomy. In our series, however, the patients remained asymptomatic in the follow-up period and hence were not subjected to endoscopic evaluation.

There is a reported case of hilar cholangiocarcinoma developing in a patient following hepaticoduodenostomy [8]. Our series has not reported this to date.

There are studies that state that in cases of hepaticoduodenostomy there is reflux and retention of duodenal contents in the biliary tree increasing the chances of cholangitis and stricture formation [7]. However, in our opinion, if the anastomosis is made wide, there is adequate emptying of the duodenal contents from the biliary tree, which obviates the chances of cholangitis. This is also proven by the absence of retained air in the biliary radicals in the follow-up ultrasound of the abdomen in our patients. The importance of a wide anastomosis has also been stressed by Todani *et al.* [9]. The minimum diameter should be 3 cm, as recommended by Tao *et al.* [10].

In our study, only one (3.2%) patient developed an anastomotic leak. This is in parallel with the leak rates in hepaticojejunostomies [11]. Hence, we recommend the use of this technique in the treatment of choledochal cyst.

Two (6.4%) of our patients had prolonged serous discharge from the drain site postoperatively. These were also the patients who had prior attacks of cholangitis and dense periportal adhesions. This may have been due to prolonged leak due to damage to the lymphatics during the extensive dissection at the perihilar region.

Conclusion

A wide hepaticoduodenostomy is a favorable alternative to the conventional Roux-en-Y hepaticojejunostomy in cases of choledochal cyst. It is more physiological, requires less time, and has complications comparable to those of the latter.

Conflicts of interest

There are no conflicts of interest.

References

1 Besner GE. Pediatric choledochal cyst surgery treatment and management. Medscape Drugs & Diseases; 2015. Available at: *http://emedicine.medscape.com/article/934267-treatment*.

2 Narayanan SK, Chen Y, Narasimhan KL, Cohen RC. Hepaticoduodenostomy versus hepaticojejunostomy after resection of choledochal cyst: a systematic review and meta-analysis. *J Pediatr Surg* 2013; **48**:2336–2342.

3 Santore MT, Behar B, Blinman TA, Doolin EJ, Hedrick HL, Mattei P, *et al*. Hepaticoduodenostomy vs hepaticojejunostomy for reconstruction after resection of choledochal cyst. *J Pediatr Surg* 2011; **46**: 209–213.

4 Schimpl G, Aigner R, Sorantin E, Mayr J, Sauer H. Comparison of hepaticoantrostomy and hepaticojejunostomy for biliary reconstruction after resection of a choledochal cyst. *Pediatr Surg Int* 1997; **12**: 271–752.

5 Saing H, Han H, Chan KL, Lam W, Chan FL, Cheng W, Tam PK. Early and late results of excision of choledochal cysts. *J Pediatr Surg* 1997; **32**: 1563–1566.

6 Mukhopadhyay B, Shukla RM, Mukhopadhyay M, Mandal KC, Mukherjee PP, Roy D, *et al*. Choledochal cyst: a review of 79 cases and the role of hepaticodochoduodenostomy. *J Indian Assoc Pediatr Surg* 2011; **16**: 54–57.

7 Shimotakahara A, Yamataka A, Yanai T, Kobayashi H, Okazaki T, Lane GJ, Miyano T. Roux-en-Y hepaticojejunostomy or hepaticoduodenostomy for biliary reconstruction during the surgical treatment of choledochal cyst: which is better? *Pediatr Surg Int* 2005; **21**:5–7.

8 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. pp. 17–21.

9 Todani T, Watanabe Y, Urushihara N, Noda T, Morotomi Y. Biliary complications after excisional procedure for choledochal cyst. *J Pediatr Surg* 1995; **30**:478–481.

10 Tao KS, Lu YG, Wang T, Dou KF. Procedures for congenital choledochal cysts and curative effect analysis in adults. *Hepatobiliary Pancreat Dis Int* 2002; **1**:442–445.

11 Li MJ, Feng JX, Jin FQ. Early complications after excision with hepaticoenterostomy for infants and children with choledochal cyst. *Hepatobiliary Pancreat Dis Int* 2002; **1**:281–284.