

LONG TERM OUTCOME AND COMPLICATIONS OF CHOLEDOCHODUODENOSTOMY IN BENIGN BILIARY DISEASES - AN OBSERVATIONAL STUDY

¹Dr Vikesh Kumar, ²Dr Sourabh Sharma, ³Dr Hanuwant Singh Rathore, ⁴Dr Ripudamanjit Kaur,
⁵Dr Sabreena Kumar⁵

^{1,2,3}Associate Professor, ⁴Senior Resident, ⁵Junior Resident
Department of General Surgery
^{1,2,3,5}Pacific Medical college and Hospital, Udaipur, Rajasthan, India
⁴Sri Guru Ram Das Charitable Hospital, Sri Amritsar, Punjab, India

Abstract- Biliary-enteric anastomosis (BEA) is a popular surgical procedure performed for the management of several benign and malignant diseases. Hepaticojejunostomy, choledochojejunostomy and choledochoduodenostomy are BEA surgical procedures that establish a connection between the hepatic duct and the jejunum and the common bile duct (CBD) and the jejunum, respectively. Selecting the intestinal segment to use in performing BEA is still controversial and depends on the experience of the surgeon rather than on any objective criteria.

Aim: To prove that choledochoduodenostomy is safer procedure to be performed.

Method: an observational study including 25 patients those who underwent choledochoduodenostomy/hepaticoduodenostomy for biliary tract disease.

Result: Duodenum for the biliary enteric continuity is associated with lesser operative times and shorter hospital stays compared with a Roux limb for reconstruction.

Conclusion: A broad Hepaticoduodenostomy is a good substitute for the standard Roux-en-Y hepaticojejunostomy as it is more physiological, takes less effort, and also requires less time.

Keywords: Choledochoduodenostomy, hepaticojejunostomy, biliary enteric anastomosis, choledocholithiasis

INTRODUCTION:

Biliary-enteric anastomosis (BEA) is a surgical procedure of choice performed for the management of a variety of biliary tract diseases. Although, indications for surgical creation of biliary-enteric anastomosis (BEA) have been significantly reduced because of improvement and advancement in interventional endoscopy (sphincterotomy and biliary endoprosthesis placement), which have proved quite useful for the patients with malignant obstruction and choledocholithiasis. However, surgery is still indicated when the CBD is larger than 1.5 cm, when large stones occupy the CBD, and when tight and extensive stenosis of the papilla are present, especially in the long-term treatment of elderly patients.⁽¹⁾ This procedure (BEA) carries a significant risk of developing complications which have been estimated to range from 3% to 43% and includes anastomotic leak, haemorrhage, cholangitis, stones, stricture formation.⁽²⁾ The Roux-en-Y anastomosis is preferred method of repair for biliary enteric continuity because it has fewer cholangitis and anastomotic leak problems.⁽³⁾ Choledochoduodenostomy (CD) has been believed to cause certain long-term complications, such as sump syndrome and reflux gastritis. Therefore, because of its complications CD has always been considered inferior to a Roux-and-Y hepaticojejunostomy (HJ).⁽⁴⁾ Hepaticojejunostomy (HJ) anastomosis with a Roux-en-Y limb is preferred by most of the surgeons as the Roux limb exerts less tension on the suture line, which reduces the risk of bile leak problems. In addition, intestinal diversion away from the biliary tree prevents cholangitis from developing postoperatively. Despite this there are still some surgeons who prefer hepatic-duodenostomy (HD) reconstruction.⁽⁵⁾ The benefits of HD include shorter recovery times for bowel function due to less intestinal manipulation and shorter operating times because there is just one anastomosis instead of three in a jejunal reconstruction.⁽⁶⁾ Using the duodenum as a conduit for anastomosis is thought to result in a higher prevalence of reflux, which in turn increases the risk of postoperative cholangitis, anastomotic stricture, and, rarely, the development of cancer.⁽⁷⁾ (Figure 1)

Another benefit of hepaticoduodenostomy is that it allows endoscopic evaluation in future, if needed.⁽⁸⁾ Also, it helps prevent peptic ulcer/pyloric ulcer via neutralization of gastric juice.⁽⁹⁾

Due to the single anastomosis, using the duodenum in the biliary reconstruction has various benefits such as shorter operating periods and a lower risk of anastomosis leakage; thus, the duodenum must be adequately mobilized to reach the common bile duct stump for a tension-free anastomosis in order for an HD to be considered safe. It is contraindicated and should be converted to HJ if there is tension in the anastomosis.⁽¹⁰⁾

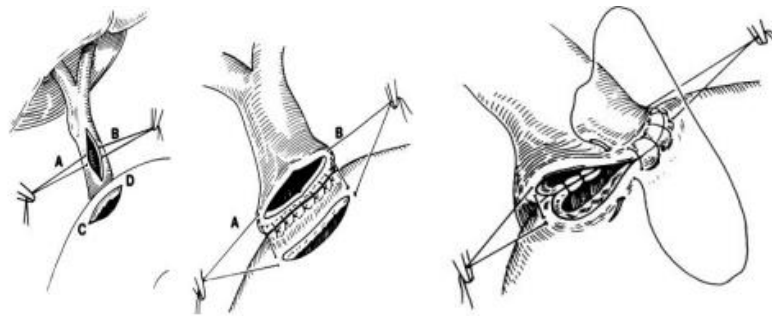


Figure 1: Diagrammatic representation of longitudinally placed incisions in the bile duct and duodenum and construction of two layered anastomosis⁽¹¹⁾

MATERIALS AND METHOD:

Study area: This study was conducted in Udaipur, tertiary care hospital, catering large number of patients with general surgical and gastrointestinal disorders.

Study population: Patients who underwent surgical treatment for benign biliary disease were identified. Among these who underwent choledochoduodenostomy/ hepaticoduodenostomy included in study.

Study design and study period

This study was observational study. Our study included cases during Jan 2019 to March 2023

Sample size: 25 patients

Inclusion criteria:

1. Patients of both sex and age group 20-80 years.
2. Clinical signs/symptoms, examination findings in favor of biliary tract disease
3. Diagnosed case of Biliary tract disease based on finding of radiological imaging like USG, CECT/ MRI with MRCP

Exclusion criteria:

1. Patients diagnosed to have malignant biliary tract disease.

Study protocol :

Surgical procedure performed for biliary tract disease was noted along with any other procedure performed simultaneously. Findings of intra-operative leak test, and post-operative outcome were recorded in form of any episode of SSI, Bile leak, bleeding, or any mortality.

Follow up done every 3 months for first year, every six months in second year and yearly thereafter. On long term, any event of cholangitis, jaundice or biliary stricture was noted. If patient needed any additional procedure during follow-up were also recorded. These patients OPD records were then used in the data collection process; their clinical state, the emergence of new symptoms, the level of morbidity, and the length of follow-up were noted. To ensure compliance with follow-up for patients who were lost to follow-up, calls were made to them at the number listed on the data identification page in the patient's case. Patients were asked to follow up at the OPD Surgery during the phone interview. The follow-up protocol also 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.

Summary of statistics is presented in the tables and percentage.

RESULTS:

Total 25 patients were the subject of this observational study in Udaipur, Rajasthan. All patients who complained of abdominal pain and have examination findings and diagnostic investigations favoring our study were included. Majority of patients i.e. 40% (10 patients) were between the ages of 41 and 60. About 60% of the study group included male patients. Only six (24%) patients in my study complained of fever associated with vague abdominal pain. 22 individuals (88% of cases) came with complains of yellowish skin discoloration and only 6 out of 25 (24%) had history of fever; although all patients had common complain of pain abdomen which was more or less constant and dull. On presentation, none of the patients had a history of vomiting. Of the 25, 18 patients (72%) had severe icterus upon examination (although 22 patients (88%) presented with c/o yellowish discoloration of skin (jaundice)). Pallor and abdominal distention were present in only 4% (1 patient).

In my study, 2 patients had a history of prior surgery, and 21 (84%) patients had a history of stenting. Out of 25, only 5 of the patients (20%) had hemoglobin levels less than 10 g/dL prior to surgery, but none of them required blood transfusion peri-operatively. Four patients (16%) had TLC counts of more than 11,000. About 52% patients had raised total bilirubin (more than 1 gm/dL).

Thirteen of the total number of patients (52%) had choledocholithiasis, six (24%) had chronic pancreatitis, two (8%) had choledochal cysts, two (8%) had post-open cholecystectomy (OC) bile ducts injury, and two (8%) had recurrent pyogenic cholangitis (RPC). Intra-operatively CBD wall was found to be thick in 21 cases.

Since, the use of duodenum for the enteric continuity is associated with lesser operative times and shorter hospital stays compared with a Roux limb for reconstruction⁽⁶⁾; we preferred

choledochoduodenostomy as the fundamental procedure for all the patients in our study.

About 90% of patients had negative results from the leak test intraoperatively. However, Six (24%) individuals had to undergo lateral pancreaticojejunostomy as a subsequent operation.

Following surgery, each patient made a good recovery. Follow up was done for mean duration of 36 months \pm 12 months. Only one (4%) patient required additional procedure, two had a surgical site infection (8%) and none of the patients experienced a bile leak. None of the patients had stricture during the follow up evaluation; 1 patient developed cholangitis and responded well to conservative treatment with antibiotics. (Table 1)

Table 1: results

PARAMETERS	NUMBER OF PATIENTS (N=25)	PERCENTAGE (%)
1. Age:		
a) <40 years	8	32
b) 41-60 years	10	40
c) >60 years	7	28
2. Sex:		
a) Male	15	60
b) Female	10	40
3. Presenting Complain:		
a) Pain	25	100
b) Fever	6	24
c) Jaundice	22	88
4. On examination:		
a) Icterus	18	72
b) Pallor	4	16
c) Abdominal distention	1	4
5. Past History:		
Previous surgery for similar complains	2	8
6. Investigations:		
a) Hb = <10gm/dL	5	20
>10gm/dL	20	80
b) TLC = 4 -11000	21	84
>11000	4	16
c) Total Bilirubin –		
<1.0 mg/dL	12	48
>1.0 mg/dL	13	52
7. Diagnosis:		
Choledocholithiasis	13	52
Chronic pancreatitis (CP)	6	24
Choledochal Cyst	2	8
Post OC Bile Duct injury	2	8
RPC (recurrent pyogenic cholangitis)	2	
8. CDD as primary procedure:	25	100
9. Secondary procedure (Lateral pancreaticojejunostomy)	6	24
ON FOLLOW UP (36\pm12 months)	NUMBER OF PATIENTS (N=25)	PERCENTAGE (%)
a) SSI	2	8

b)	Bile leak	None	0
c)	Add on procedure	1	4
d)	Cholangitis	1	4
e)	Mortality	None	0

Hb = Haemoglobin

TLC = Total leukocyte count

OC = Open cholecystectomy

CDD = Choledochoduodenostomy

DISCUSSION:

Several studies have supported the use of Hepaticoduodenostomy as an alternative to Roux-en-Y in the recent literature. ⁽¹⁰⁾ There are numerous advantages and disadvantages to both these procedures. With low and middle CBD stenosis/stone (type 1 and 2) the anastomosis can be either choledochojejunal or hepaticojejunal, whereas for higher stenosis (type 3) a Roux-en-Y anastomosis is mandatory. In type 4 stenosis surgery includes a first phase aimed at biliary reconstruction, and if this is not possible the preparation of two different anastomosis between the biliary ducts and the jejunal loop or single anastomosis between duodenum and biliary duct. As consequence of the surgical therapeutic approach a duodenobiliary reflux occurs constantly in patients treated with choledochoduodenal anastomosis, and a bile flux diversion is present in hepaticojejunal anastomosis. ⁽¹⁾ Therefore, angiocholitis and pancreatitis are quite frequent due to stenosis of the anastomosis or to stone migration, and they must be recognized by the radiologist in the study of patients treated with BEA. ⁽¹⁾

The Roux-en-Y hepaticojejunosomy 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 also 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. ⁽¹³⁾

Some of these limitations are addressed through Hepaticoduodenostomy. Due to the requirement of only one anastomosis, it maintains the natural bowel continuity and is quicker and less laborious. We believe that because it is more physiological, the likelihood of postoperative adhesion intestinal obstruction is lower and endoscopic stenting is an option if necessary. Shimotakahara *et al.* reported that the incidence of postoperative endoscopy-proven biliary gastritis is greater in patients who have undergone Hepaticoduodenostomy. ⁽¹⁴⁾ 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. ⁽¹⁵⁾ 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. ⁽¹⁴⁾ In our opinion, the odds of cholangitis are eliminated, if the anastomosis is made wide enough to allow for proper emptying of the duodenal contents from the biliary tree. This is further demonstrated by the fact that none of our patients on follow-up abdominal ultrasound scan revealed any trapped air in the biliary radicals. The importance of a wide anastomosis has also been stressed by Todani *et al.* ⁽¹⁶⁾ The minimum diameter should be 3 cm, as recommended by Tao *et al.* ⁽¹⁷⁾

In our study, none of the patient developed an anastomotic leak. This is in parallel with the leak rates in hepaticojejunosomies. ⁽¹⁸⁾ Hence, we recommend the use of this technique in the treatment of choledocholithiasis and choledochal cyst.

Two (8%) of our patients had prolonged serous discharge from the drain site postoperatively. And one of them had prior attacks of cholangitis and dense periportal adhesions. This might have been because of persistent leak brought on by the substantial lymphatic dissection at the perihilar region.

After CDD, Japanese colleagues found that endoscopically verified bilious gastritis occurred in 33% (12 patients). ⁽³⁾ Following routine endoscopic evaluation on all of their cases following HD, some authors observed that all cases in their series after CDD (eight instances) showed mild to moderate gastric mucosal erosion and bile reflux through the pyloric ring. ⁽¹⁹⁾ In our institution, we exclusively perform endoscopies in symptomatic instances following CDD in which we suspect gastritis or bile reflux. Endoscopy can also help address the emergence of anastomotic strictures in the patients. In our study, During the follow-up period, 2 patients underwent ERCP, and 1 patient had to undergo surgery again for the same (hepaticojejunosomy). Most of the patients are still being followed up.

CONCLUSION:

In our study, choledocholithiasis, cyst excision, and CP reconstruction procedures using the duodenum have demonstrated shorter operating times and hospital stays with comparable morbidity and mortality rates when compared to procedures using a Roux limb repair, similar to those reported in the literature. In our series, none of the case had bile gastritis.

In choledocholithiasis, choledochal cyst and other instances, a broad Hepaticoduodenostomy is a good substitute for the standard Roux-en-Y hepaticojejunosomy. Although, it has issues and few complications similar to those of the latter, is more physiological, takes less effort, and also requires less time.

CONFLICTS OF INTEREST: None

FUNDING: None

REFERENCES:

1. Pavone, P., Passariello, R. (1997). Biliary-Enteric Anastomoses. In: MR Cholangiopancreatography. Springer, Berlin, Heidelberg.
2. Boraschi P, Donati F. Biliary-enteric anastomoses: spectrum of findings on Gd-EOB-DTPA-enhanced MR cholangiography. *Abdom Imaging*. 2013 Dec;38(6):1351-9. doi: 10.1007/s00261-013-0007-7. PMID: 23820693.
3. Shimotakahara A, Yamataka A, Yanai T, *et al*. 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.
4. Schreuder AM, Franken LC, van Dieren S, Besselink MG, Busch OR, van Gulik TM. Choledochoduodenostomy versus hepaticojejunostomy - a matched case-control analysis. *HPB (Oxford)*. 2021 Apr;23(4):560-565. doi: 10.1016/j.hpb.2020.08.014. Epub 2020 Sep 13. PMID: 32938564.
5. Gardikis S, Antypas S, Kambouri K, *et al*. The Roux-en-Y procedure in congenital hepato-biliary disorders. *RomGastroenterol*2005;**14**:135–40.
6. Santore MT, Behar BJ, Blinman TA, *et al*. Hepaticoduodenostomy vs hepaticojejunostomy for reconstruction after resection of choledochal cyst. *J Pediatr Surg*2011;**46**:209–13.
7. Narayanan SK, Chen Y, Narasimhan KL, *et al*. Hepaticoduodenostomy versus hepaticojejunostomy after resection of choledochal cyst: a systematic review and meta-analysis. *J Pediatr Surg*2013;**48**:2336–42.
8. Saxena, Nandita A.; Kulkarni, Bharati K.; Borwankar, Shyam S.; Lahoti, Hemant N.; Multani, Pooja; Oak, Sanjay N.. Hepaticoduodenostomy as a technique for biliary anastomosis in children with choledochal cyst: an experience with 31 cases. *Annals of Pediatric Surgery* 13(2):p 78-80, April 2017. | DOI: 10.1097/01.XPS.0000508440.37104.0d
9. Michael S. McArthur MD, William P. Longmire MD. Peptic ulcer disease after choledochojejunostomy. *The American Journal of Surgery*. Volume 122, Issue 2, August 1971, Pages 155-158
10. Serber J, Stranzinger E, Geiger JD, *et al*. Association of gastroschisis and choledochal cyst. *J Pediatr Surg*2009;**44**:e23–6.
11. Vogt DP, Hermann RE. Choledochoduodenostomy, choledochojejunostomy or sphincteroplasty for biliary and pancreatic disease. *Ann Surg* 1981 Feb;193(2):161-168
12. 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
13. 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.
14. 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.
15. Todani T, Watanabe Y, Toki A, Hara H, Koyanagi Y, Aoki T. Hilar duct carcinoma developed after cyst excision followed by hepaticoduodenostomy. *Pancreaticobiliary maljunction*. Tokyo, Japan: Igaku Tosho Shuppan; 2002. 17–21.
16. 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.
17. 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.
18. 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.
19. Takada K, Hamada Y, Watanabe K, *et al*. Duodenogastric reflux following biliary reconstruction after excision of choledochal cyst. *Pediatr Surg Int*2005;**21**:1–4.