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Original Article

OUR EXPERIENCE HEPATICO-DUODENOSTOMY AND ROUX-EN-YHEPATICO-JEJUNOSTOMY AFTER PEDIATRICCHOLEDOCHAL CYST EXCISION IN A TERTIARY CARE CENTRE

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Abstract

Introduction: Hepatico-duodenostomy and Roux-en-Y Hepaticojejunostomy are two different types of Biliary Enteric Anastomosis (BEA) which is a common surgical procedure performed after Choledochal cyst excision**.** Ouraims the outcome of Hepatico-duodenostomy and Roux-en-Y **.**Hepatico-jejunostomy after excision of Pediatric Choledochal cyst in a Tertiary care PediatricSurgery Centre.

Aims & Objectives: Compare the outcomes of different biliary enteric anastomosis, immediate post operative and late complications with their long term follow up.

Methods: After Proper diagnosis and optimization, excision of choledochal cyst and biliary enteric anastomosis was done in all cases. In one group, reconstruction was done by Hepatico- duodenostomy (HD) and other group by Roux –en –Y hepaticojejunostomy (HJ). Post operatively after few days of parenteral therapy and nil orally enteric nutrition was started subsequently. Early complications like post op bleeding, post op biliary leak, cholangitis, paralytic ileus, surgical site infection, post operative Intestinal obstruction, and need for re operation are noted and tabulated. Late complications like reflux gastritis, cholangitis, pancreatitis, intestinal obstruction due to adhesions, incisional hernia, intrahepatic stone formation are enquired in OPD follow-up and data was included in study. Data like duration of surgery, post operative stay, patient profile all are collected from BHT, OT register and OPD Register. All data was collected and tabulated.

Results & Analysis: We studied a total of 42 patients. 12 were male (28.6%) and 30 were female (71.4%). Male to female ratio was 1:2.4. Among male patients 3 had hepatico-duodenostomy (HD) and 9 had hepaticojejunostomy (HJ) as biliary reconstruction. Among female patients 20 patients were in HD group and 10 patients were HJ group.The main clinical presenting features were pain abdomen (81%), nausea and vomiting (71.4%), palpable mass (64.3%), fever (40.5%), jaundice (35.7%), hepatomegaly (31%). The classical triad of pain, jaundice and lump was present in 6 patients (14.3%).In post operative period, 25 patients recovered uneventfully. 7(16.7%) patients suffered from post operative bile leak. Early cholangitis occurred in 4 (9.5%) and pancreatitis occurred in 2 (4.8%) patients all of which managed conservatively. Wound infection occurred in 2(4.8%) patients for which secondary suturing required later. 1 patient had burst abdomen for which re laparotomy was

done. On follow up, no late complications were diagnosed in 41 patients. One patient from HJ group was diagnosed of having Incisional hernia.

Conclusions: Hepatico-duodenostomy can be used in the reconstruction after cyst excision due to its technical simplicity and being more physiological. In the present study, the Hepatico-duodenostomy had a shorter operative time, early onset of feeds, and reduced hospital stay without the potential disadvantages of the hepaticojejunostomy approach. However, a long-term prospective study would be needed to deduce definitive conclusions.

Key Words: Biliary Enteric Anastomosis (BEA), Hepatico- duodenostomy (HD) ; Roux –en –Y hepaticojejunostomy (HJ), abnormal junction between bilio-pancreatic ducts (ABPJ)

INTRODUCTION

Hepatico-duodenostomy and Roux-en-Y Hepaticojejunostomy is two different types of Biliary Enteric Anastomosis (BEA) which is a common surgical procedure performed after Choledochal cyst excision.

It is also done in different benign andmalignant hepatico biliary conditions like Primary Biliary stone, Iatrogenic Bile Ductinjury, Liver Transplantation, Primary Sclerosing Cholangitis, Hepatolithiasisetc[1,2]. Theconsequences of BEA in Pediatric population bear a wide spectrum of analysis. Ourstudy aims the outcome of Hepatico-duodenostomy and Roux-en-YHepaticojejunostomy after choledochal cyst excision in a Tertiary care Pediatric Surgery Centre.

AIMS AND OBJECTIVES

1. To study early and late complications of Biliary Enteric Anastomosis.
2. Compare the outcomes of different biliary enteric anastomosis.
3. Long term follows up after choledochal cyst excision and biliary enteric anastomosis.

MATERIALS AND METHODS

Ethical Statement: Institutional Ethical committee clearance was taken from IPGME&R with memo no IPGME&R/IEC/2021/472.

Type of study: Single institute based observational prospective study.

Place of study: Department of Pediatric surgery IPGME&R and SSKM Hospital,Kolkata

Duration of study: Two years from March 2021 to February 2023

Study population: We have selected 42 patients who were diagnosed and admitted with Choledochal cyst in the Department of Pediatric surgery.

Inclusion criteria:

Children (age under 12 year) with diagnosis of type I-choledochal cyst and treated by excision of Cyst and Biliary-enteric anastomosis either Hepatico-duodenostomy (HD) or Roux-en-Y Hepaticojejunostomy (HJ) have been included in our study. Post-operative patients have been followed up in OPD for at least 4 months.

Exclusion criteria:

1. Age less than 3months and more than 12 years
2. Types of choledochal cyst (type II, III, IV, V) and Forme frusteCholedochal cyst
3. Choledochal cyst with cholangitis within 6 weeks of surgery
4. Choledochal cyst with associated anomalies like Cardiac and Renaldisease
5. Patients unfit for surgery and severe malnutrition
6. Incomplete excision of choledochal cyst
7. Parents of child not willing to undertake study

Description of intervention: Patients presenting with different clinicalfeatures like pain abdomen, jaundice, vomiting, fever and after clinicalassessment of lump abdomen, cholangitis, or pancreatitis, patients wereinvestigated by blood (complete blood count, Liver Function Test, RenalFunction Test, Coagulation Profile) and Radiological investigation (USG, CECTAbdomen, MRCP, X-Ray Abdomen) and finally diagnosis of Choledochal cyst isestablished and type was confirmed.After optimization and preoperative anesthetic checkup (PAC) fitness,patients are posted for surgery under General Anesthesia (GA). Patients werefully explained about nature of the disease, operative procedure, possiblecomplications. Consent for treatment and study was obtained with ScientificStudy Proforma.

During surgery, excision of choledochal cyst and biliary entericanastomosis was done in all cases. In one group, reconstruction was done byhepatico-duodenostomy (HD) and other group by Roux –en –Y

hepaticojejunostomy (HJ). Post operatively patient was kept Nil per mouth(NPM), put on intravenous Fluid and Total Parenteral Nutrition (TPN), ivantibiotic (after giving pre op first dose), proper analgesia. Enteric nutritionwas started subsequently. Early complications like post op bleeding, post operative biliary leak, cholangitis, paralytic ileus, surgical site infection, post operativeIntestinal obstruction, and need for re operation are noted and tabulated.

Late complications like reflux gastritis, cholangitis, pancreatitis, intestinalobstruction due to adhesions, incisional hernia, intrahepatic stone formationare enquired in OPD follow-up and data was included in study. Data likeduration of surgery, post operative stay, patient profile all are collected fromBHT, OT register and OPD Register. All data was collected and tabulated.

RESULTS

Sample Size Calculation:

A. Sample size: The calculated sample size will be 42 using sample size calculation formula [Z 2 p (1-p)/d 2] considering 95% confidence interval (so, Z=1.96), p = proportion of Choledochal cyst patient undergoing hepatico-duodenostomy i.e. assuming 50% to gain highest sample size, d=30% = relative precision i.e. (30% of 50% = 0.3*0.5=0.15).

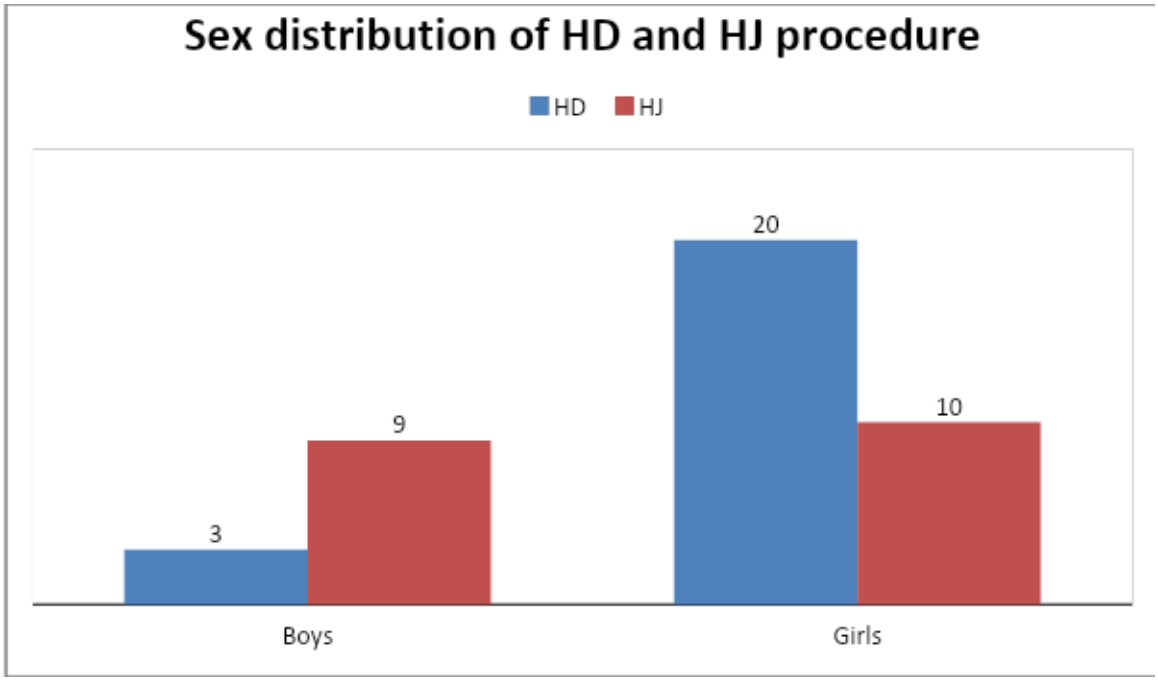
B. Sampling technique: In IPGME&R and SSKM Hospital the number of patients suffering from choledochal cyst undergoing surgery is approximately 30 per year with number of HD & HJ 15 per year respectively. So, complete enumeration technique used to select the study subjects.

Result Analysis:

We studied a total of 42 patients. 12 were male (28.6%) and 30 were female (71.4%). Male to female ratio was 1:2.4. Among male patients 3 had Hepatico-duodenostomy (HD) and 9 had hepaticojejunostomy (HJ) as biliary reconstruction. Among female patients 20 patients were in HD group and 10 patients were HJ group.

Sex distribution of HD (Hepatico-duodenostomy) and HJ(hepatico-Jejunostomy) procedure. Boys & category 2 are Girls We studied a total of 42 patients. 12 were male (28.6%) and 30 were female (71.4%). Male to female ratio was 1:2.4. Among male patients 3 had hepatico-duodenostomy (HD) and 9 had hepaticojejunostomy (HJ) as biliary reconstruction. Among female patients 20 patients were in HD group and 10 patients were HJ group.

Chart 1: Sex Distribution of patients undergone HD and HJ



***HD= hepaticoduodenostomy , HJ= hepaticojejunostomy**

Age at the time of intervention ranged from 3 months to 12 years.

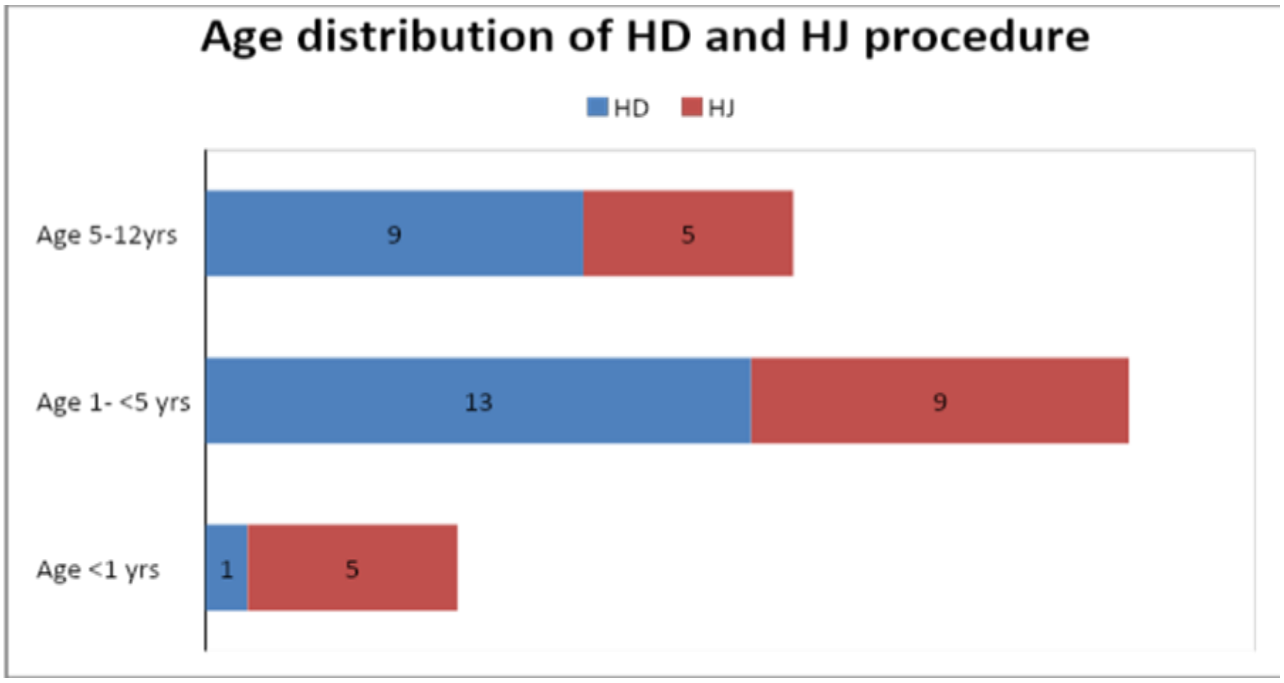


Chart 2: Age distribution of patients undergone HD and HJ

The main clinical presenting features were pain abdomen (81%), nausea and vomiting (71.4%), palpable mass (64.3%), fever (40.5%), jaundice (35.7%), hepatomegaly (31%). The classical triad of pain, jaundice and lump was present in 6 patients (14.3%).

Symptoms						
			HD		**HJ**	
Pain Abdomen						
Absent	**8**	**19.0%**	**3**	**37.5%**	**5**	**62.5%**
Present	**34**	**81.0%**	**20**	**58.8%**	**14**	**41.2%**
Jaundice						
Absent	**27**	**64.3%**	**16**	**59.3%**	**11**	**40.7%**
Present	**15**	**35.7%**	**7**	**46.7%**	**8**	**53.3%**
Vomiting						
Absent	**12**	**28.6%**	**8**	**66.7%**	**4**	**33.3%**
Present	**30**	**71.4%**	**15**	**50.0%**	**15**	**50.0%**
Fever						
Absent	**25**	**59.5%**	**14**	**56.0%**	**11**	**44.0%**

Present	**17**	**40.5%**	**9**	**52.9%**	**8**	**47.1%**
Hepatomegaly						
Absent	**29**	**69.0%**	**16**	**55.2%**	**13**	**44.8%**
Present	**13**	**31.0%**	**7**	**53.8%**	**6**	**46.2%**
Palpable Mass						
Absent	**15**	**35.7%**	**8**	**53.3%**	**7**	**46.7%**
Present	**27**	**64.3%**	**15**	**55.6%**	**12**	**44.4%**
Clasical Triad						
Absent	**36**	**85.7%**	**21**	**58.3%**	**15**	**41.7%**
Present	**6**	**14.3%**	**2**	**33.3%**	**4**	**66.7%**

***HD= hepaticoduodenostomy , HJ= hepaticojejunostomy**

Table 1: Clinical Features of patients undergone HD and HJ

*HD= hepatico-duodenostomy, HJ= hepatico-jejunostomy

Bivariate Analysis of Operative procedure result data:

H1: There is a significant difference in duration to perform the operation between Hepatico-duodenostomy (HD) and Hepaticojejunostomy (HJ) operation.

An independent sample t-test was conducted to compare the duration to perform the operation for Hepatico-duodenostomy and Hepaticojejunostomy Operation.

There was significant difference [t(40) = -8.997, p= 0.000] in the scores with mean score for Hepatico-duodenostomy (M = 105.43, SD= 13.64) was lower than Hepatico-jejunostomy (M = 142.63, SD= 12.95). The magnitude of the differences in means(mean difference= -37.197, 95% CI: -45.55to -28.84) was significant. Hence H1 supported. An independent sample t-test was conducted to compare the duration to perform the operation for Hepatico-duodenostomy and Hepaticojejunostomy Operation. There were significant difference [t(40) = -8.997, p= 0.000] in the scores with mean score for Hepatico-duodenostomy (M = 105.43, SD= 13.64) was lower than Hepatico-jejunostomy (M = 142.63, SD= 12.95). The magnitude of the differences in means (mean difference= -37.197, 95% CI: -45.55to -28.84) was significant. Hence H1 supported.

				Levene's Test for Equality of Variances		t-test for Equality of Means						
		Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
											Lower	Upper
DV	G1	105.43	13.64	0.9	0.35	-8.997	40	0.000	-37.197	4.13	-45.55	-28.84
	G2	142.63	12.95									

Note: Equal variances assumed

Type of OT	Max.	Min.	Mean	SD	p-value
HD	130	85	105.43	13.64	<0.0001
HJ	165	110	142.63	12.95	

Table- 2: Differences in duration to perform the operation between Hepatico-duodenostomy and Hepaticojejunostomy Operation (N=42)

H1: *There is a significant difference in Time to start oral feed after operation between Hepatico-duodenostomy and Hepaticojejunostomy Operation*

An independent sample t-test was conducted to compare the Time to start oral feed after operation between Hepatico-duodenostomy and Hepaticojejunostomy Operation. There were significant difference [t(40) = -3.862, p= 0.000] in the scores with mean score for Hepatico-duodenostomy (M = 4.7, SD= 1.06) was lower than Hepatico-jejunostomy (M = 6.21, SD= 1.47). The magnitude of the differences in means (mean difference= -1.515, 95% CI: -2.31 to -0.72) was significant. Hence H1 supported.

				Levene's Test for Equality of Variances		t-test for Equality of Means						
		Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
											Lower	Upper
DV	HD	4.7	1.06	0.99	0.32	-3.862	40	0.000	-1.515	0.39	-2.31	-0.72

	HJ	6.21	1.47									

#Note: Equal variances assumed

Type of OT	Max.	Min.	Mean	SD	p-value
HD	7	3	4.7	1.06	<0.0001
HJ	10	4	6.21	1.47	

Table- 3: Differences in Time to start oral feed after operation between Hepatico-duodenostomy and Hepaticojejunostomy Operation (N=42)

H1: *There is a significant difference in postoperative hospital stay between Hepatico-duodenostomy and Hepaticojejunostomy Operation*

An independent sample t-test was conducted to compare the postoperative hospital stay between Hepatico-duodenostomy and Hepaticojejunostomy Operation. There were significant difference [t(25.88) = -3.58, p= 0.001] in the scores with mean score for Hepatico-duodenostomy (M = 7.17, SD= 1.5) was lower than Hepatico-jejunostomy (M = 9.79, SD= 2.88). The magnitude of the differences in means (mean difference= -2.62, 95% CI: -4.12 to -1.11) was significant. Hence H1 supported.

				Levene's Test for Equality of Variances		t-test for Equality of Means						
		Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
											Lower	Upper
DV	HD	7.17	1.5	6.09	0.02	-3.58	25.88	0.001	-2.62	0.73	-4.12	-1.11
	HJ	9.79	2.88									

#Note: Equal variances not assumed

Type of OT	Max.	Min.	Mean	SD	p-value
HD	12	5	7.17	1.5	0.001
HJ	16	6	9.79	2.88	

Table- 4: Differences postoperative hospital stay the operation between Hepatico-duodenostomy and Hepaticojejunostomy Operation (N=42)

H1: *There is a significant Differences in duration of postoperative follow up between Hepatico-duodenostomy and Hepaticojejunostomy Operation*

An independent sample t-test was conducted to compare Differences in duration of postoperative follow up between Hepatico-duodenostomy and Hepaticojejunostomy Operation. There were significant difference [t(40) = -1, p= 0.32] in the scores with mean score for Hepatico-duodenostomy (M = 9.7, SD= 5.06) was lower than Hepatico-jejunostomy (M = 11.16, SD= 4.21). The magnitude of the differences in means (mean difference= -1.46, 95% CI: -4.4 to -1.5) was not significant. Hence H1 not supported.

				Levene's Test for Equality of Variances		t-test for Equality of Means						
		Mean	SD	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
											Lower	Upper
DV	HD	9.7	5.06	2.99	0.09	-1	40	0.32	-1.46	1.45	-4.4	-1.5
	HJ	11.16	4.21									

#Note: Equal variances assumed

Type of OT	Max.	Min.	Mean	SD	p-value
HD	20	4	9.7	5.06	0.32
HJ	18	4	11.16	4.21	

Table- 5: Differences in duration of postoperative follow up between Hepatico-duodenostomy and Hepaticojejunostomy Operation (N=42)

In post operative period, 25 patients recovered uneventfully. 7(16.7%) patients suffered from post operative bile leak. Early cholangitis occurred in 4 (9.5%) and pancreatitis occurred in 2 (4.8%) patients all of which managed conservatively. Wound infection occurred in 2(4.8%) patients for which secondary suturing required later. 1 patient had burst abdomen for which re laparotomy was done.

On follow up, no late complications were diagnosed in 41 patients. One patient from HJ group was diagnosed of having Incisional hernia.

Type of Complication		HD	HJ	Comments
Early complications	Cholangitis	2	2	
	Bile leak	3	5	
	Pancreatitis	1	1	

	Burst Abdomen	0	1	
	SSSI	0	2*	
Late Complications	Incisional Hernia	0	1	
NONE		17	8	59.5%
Total		23	19*	

*One patient of HJ group had both Early and late complication

Table 6: Complications of patients undergone HD and HJ

DISCUSSION

Choledochal cyst is a disease of both boys and girls. In 1977, Todani et al, found choledochal cyst to be more common in girls with a ratio of 2.4:1, which has greatly increased to 8:1 presently (37,12). In our study, there is female predominance with ratio of 2.4:1.

The choledochal cyst usually present with a classical triad of pain abdomen, jaundice and right upper quadrant mass (36). In this study, most common presentation was pain abdomen (81%) with classical triad was present in 6 patients (14.3%).

As a diagnostic approach, abdominal ultrasound and magnetic resonance imaging were done in all patients to confirm the diagnosis and characterization of cyst. The type of reconstruction was primarily decided by the surgeon's preference, and it depended on the following factors: biliary anatomy, the surgeon's technical familiarity with the procedure and patient's pre operative status. Ultimately, intra- operative findings dictated surgical judgement on which type of reconstruction to use. If too much tension was encountered in the procedure of hepatico-duodenostomy, a Roux limb was the surgical option for such cases.

For many years, the choice of reconstruction in patient with choledochal cyst has been hepaticojejunostomy by many surgeons (42). However, hepatico-duodenostomy is gaining more popularity and is considered a simpler procedure compared to the hepaticojejunostomy in matters such as operative time, the onset of oral feed, hospital stay and post operative endoscopic accessibility of the anastomosis (38,39,41,42). Hepatico-duodenostomy is considered as a simpler procedure because it involves a single anastomosis compared to hepaticojejunostomy which involves two anastomosis that is hepaticojejunostomy and jejunojejunostomy. In addition, hepaticojejunostomy requires mobilization of jejunum via transverse mesocolon, increasing the operative time (42). This study showed a significantly shorter operative time in the hepatico-duodenostomy group that was in concordance with the results of Santore MT et al. study (39). The oral onset of feeds was earlier in theHepatico-duodenostomy group. The studies conducted by Santore MT et al. and Liem NT et al, demonstrated a shorter hospital stay, which was in concordance with the present study results (39,43). The closeness of the anastomosis to the stomach makes hepatico-duodenostomy have a greater chance of cholangitis and bile gastritis (38,39,42). Liem NT et al. showed cholangitis in 1.7% and bile gastritis in 3.8% of patients (43). Bile gastritis and cholangitis can be avoided by performing hepatico-duodenostomy anastomosis at the junction of the first

and second portion of duodenum (38,39). All the patients in this study underwent hepatico-duodenostomy anastomosis by above principle and during follow up period no late complication noted which can be compared to the results observed in the Mukhopadhyay B et li. study (44). Intestinal obstruction has been a major complication of hepaticojejunostomy due to the adhesions formed as the Roux-en-Y limb passes through the transverse mesocolon after accessing the infracolic compartment. Since hepatico-duodenostomy involves dissection and anastomosis limited in the supracolic compartment, there is less chance of adhesions and obstruction (38,40).

CONCLUSION

Hepatico-duodenostomy can be used in the reconstruction after cyst excision due to its technical simplicity and being more physiological. In the present study, the hepatico-duodenostomy had a shorter operative time, early onset of feeds, and reduced hospital stay without the potential disadvantages of the hepaticojejunostomy approach. However, a long-term prospective study would be needed to deduce definitive conclusions.

LIMITATIONS

Due to scarcity of such patient undergoing surgery, random sampling cannot be used. It will be better to plan research involving multiple institutions with study period of more than 2 years to retrieve more external validity.

Conflict of Interest-Nothing to conflict

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