



PROSPECTIVE COHORT STUDY OF CHOLEDOCHIAL CYST REMOVAL AND ROUX- EN-Y HEPATICOJEJUNOSTOMY FOR CHILDREN

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ABSTRACT

Roux-en-Y hepaticojejunostomies and laparoscopic cyst excision are becoming more common in children with choledochal cysts. It plans to determine the feasibility and safety of laparoscopic excisions with Roux-en-Y hepaticojejunostomies for children with choledochal cysts, as well as evaluate their short-term outcomes after treatment. This prospective study involves 50 consecutive pediatric patients who underwent laparoscopic choledochal cyst excision and Roux-en-Y hepaticojejunostomy. The operative time (Mean) was 225.8±68.94minutes, an intraoperative cholangiogram time is also included. Blood transfusions were needed for two children. Time to first flatus was 42.34±25.52 hours in average. Drains were removed on average in 2.75±1.07days. During the postoperative period, the average hospital stay was 9.45±3.24 days. One case of pancreatitis and bile leakage cases-five are among the 6/50 cases with early complications. Among the cases that underwent follow-up between 10 days and 3 months, the majority (90.5%) were considered to be in good health. Children can have laparoscopic choledochal cyst excisions and Roux-en-Y hepaticojejunostomy without complications. Most patients had good short-term outcomes.

KEY WORDS: Children, Roux-en-Y hepatico jejunostomy Laparoscopic excision, Choledochal cyst

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INTRODUCTION

As a congenital cystic dilatation of the biliary tract, choledochal cysts were first described by Vater and Ezler in 1723. There is a predominance of East Asians among infants and children, mainly females. Cholelithiasis, pancreatic and Malignant transformation can all occur despite choledochal cysts' benign

nature. [1,2]. The standard treatment consists of surgical excision of the choledochal cyst and reconstructive surgery of the enterobiliary system. It is recommended that choledochal cysts be excised and that biliary enteric reconstruction be performed [3]. Compared to open surgery, laparoscopic surgery is more likely to result in shorter stay



at hospital and lower rates of intrahepatic stone formation, anastomotic stenosis, bile leakage, intestinal obstruction, pancreatic leak, cholangitis and reoperations [4,5]. A laparoscopic cyst excision and Roux-en-Y hepaticojejunostomy for pediatric choledochal cysts has become a common procedure in many medical centers because it is safe, efficient, and minimally invasive [6]. Since surgeons have gained a deeper understanding of laparoscopic anatomy and invasive (minimal) techniques, they have been able to operate on technically challenging cases such as choledochal cysts, which were previously treated by laparotomy [7]. Roux-en-Y hepaticojejunostomy and laparoscopic removal of choledochal cysts are effective treatments [8]. Using laparoscopic excision and Roux-en-Y hepaticojejunostomy in children with choledochal cysts, this study studied the feasibility and safety of the procedure as well as its short-term results.

MATERIALS AND METHODS

PATIENTS

Hepaticojejunostomy via Roux-en-Y and laparoscopic cyst removal. Each procedure was performed by the same team. Among the variables studied were demographic information, operation details, intraoperative blood transfusions, postoperative flatus time, hospital stay, and postoperative complications.

OPERATIVE TECHNIQUE

Here is a summary of the laparoscopic choledochal cyst excision procedure:

- 1) Intubation and reverse Trendelenburg position were performed under general anesthesia.
- 2) Supraumbilical lobar trocar (10mm), right hypochondrium (2ports, 5mm), right side

of abdomen, and left hypochondrium have trocars.

3) Choledochal cysts and gallbladders were removed using a monopolar electrocautery hook. It was necessary to transect the cystic ducts and arteries and to separate the gallbladder from the cyst without removing it. Fundus to right diaphragm, 2/0 silk was used to suture the gallbladder to retraction the liver. Transection was performed between two hemlocks after dissecting the cyst down to the distal end of the common bile duct. Continuing upward to the common hepatic duct, the cyst was dissected. When there was severe adhesion around the cyst, thunder beat (Olympus) was used to dissect it.

4) In order to avoid ligament of Treitz damage, I used an endoscopic stapler for hepaticojejunostomy. In order to create a side-to-side enteroenterostomy, the small bowel was externalized via the enlarged umbilical port 40 cm distal to the Roux loop. The distal end of the Roux loop was advanced retrocolically. As the gallbladder was extracted from the umbilical site, the cyst was transected and removed. An examination of the bile duct revealed that there was a biliary bifurcation. After an enterotomy with interrupted Vicryl 4/0 sutures, the anastomosis was created.

5) Redon suction drains were placed posterior to hepaticojejunostomy approximately 3 days after cholecystectomy. After 3 ml of bile per hour, the drain was removed.

6) Todani-IVa cases have two bile ducts, so ductoplasty is performed after cholangioenterostomy.

TABLE1: LABORATORY TESTS AND PATIENT CHARACTERISTICS

VARIABLES	ALL PATIENTS (n=50)
GENDER	
MALE	10(19.6%)
FEMALE	40(80.4%)
AGE (MEAN, RANGE)	3.55years
SYMPTOMS	
JAUNDICE	9 (34.5%)



ABDOMINAL PAIN	18(70.5%)
NAUSEA, VOMITING	12(48.0%)
FEVER	9(35.3%)
ABDOMINAL MASS	2(4.8%)
LABORATORY FINDINGS	
INCREASED TOTAL BILIRUBIN	22 (87.4%)
INCREASED SERUM AST/ALT	13 (46.0%)
LEUKOCYTOSIS	15 (34.5%)
OPERATIVE TIME	225.8±68.94

TABLE 2: ROUX-EN-Y HEPATICOJEJUNOSTOMY AND LAPAROSCOPIC CHOLEDOCHAL CYST EXCISION SURGICAL OUTCOMES.

VARIABLES	ALL PATIENTS
NUMBER OF PATIENTS REQUIRING BLOOD TRANSFUSION	2(3.9%)
TIME TO FIRST FLATUS (hours)	42.34±25.52
BLOOD TRANSFUSION VOLUME (ml)	130.0±30.35
HOSPITAL STAY (in days)	9.45±3.24
TIME TO DRAIN REMOVAL (in days)	2.75±1.07
BILIARY LEAKAGE	5
COMPLICATIONS	
PANCREATITIS	1
FLUID COLLECTION	0
OUTCOME CLASSIFICATION (Terblanch)	n=42
I	37(90.5%)
II	4(7.1%)
III	0
IV	1(2.4%)

PATIENT POSTOPERATIVE MANAGEMENT

Liquid diets are usually started on the first postoperative day. Postoperative day 4 will be the day when Jackson-Pratt drains are removed if there is no abnormal fluid collection. In order to monitor any postoperative complaints, a follow-up visit was scheduled three months after discharge. In order to diagnose complications such as pancreatitis, cholangitis, choledocholithiasis, or obstruction of the anastomosis, routine blood tests, liver functions, ultrasounds, or CT scans were performed. Terblanche classifications [9] describe clinical outcomes.

The symptoms are classified as grade I, II, III, and IV. Grade I symptoms are those that don't need medical attention, grade II symptoms are transitory, and grade III symptoms are biliary symptoms that need medical attention. TERBLANCHE IV performed poorly. Excellent, good and fair results in Terblanche I, II, and III.

DATA ANALYSIS

The frequency and standard deviation of each variable were calculated. A t-test was used on other continuous variables to compare children and adults. A SPSS 18.0 program was used to calculate p-values and confidence intervals. The statistical significance level was



set at $p < 0.05$

RESULTS

There were 40 females and 10 males among the patients. A mean age of 3.55 years was recorded at the time of surgery. Table 1 shows the characteristics of the patients and the features of the operation. 70.5% of the children reported abdominal pain, 12 reported nausea and vomiting (48%), 9 reported jaundice (34.5%), and 13 reported elevated serum hepatic enzyme levels (46.0%). In 22 children (87.4%), serum bilirubin levels increased with various symptoms of jaundice. The mean operative time was 225.8 ± 68.94 minutes, including the time for intraoperative cholangiography. There were no cases where the conversion to open occurred.

A laparoscopic choledochal cyst excision and Roux-en-Y hepaticojejunostomy are shown in Table 2. It was necessary to transfuse blood for two children with total packed red blood cell volume of 130.0 ± 30.35 ml. Time to first flatus was 42.34 ± 25.52 hours in average. To remove the drains, it took an average of 2.75 ± 1.07 . During the postoperative period, the average hospital stay was 9.45 ± 3.24 days. One case of pancreatitis and five cases of bile leakage were among the six early complications. Five cases were initially treated with conservative measures, which resulted in a complete resolution. One case of persistent bile leakage required reoperation. Within 3 months of discharge from the hospital, the majority of cases were classified as good.

DISCUSSION

An Asian majority is most likely to suffer from choledochal cysts, a congenital abnormality of the biliary system. It has been estimated that the incidence of pancreatobiliary ductal unions and choledochal cysts are 0.3% and 4.1%, respectively. Clinically, choledochal cysts present differently in children and adults. It is possible for adults with this disease entity to develop malignancies in the biliary system, such as biliary cholangiocarcinoma or gallbladder cancer [11]. There is a risk that the cyst can develop malignancies or complications, so it must be completely removed to minimize that risk. A

growing number of hepatobiliary surgeries are being performed laparoscopically as cosmetics become more popular [12]. Laparoscopic hepaticojejunostomy anastomoses are among the most complex and challenging surgeries ever performed. Laparoscopic surgery for treating choledochal cysts has been shown to be safe and feasible since 1995 [13].

In addition to its remarkably higher incidence among females, choledochal cysts also tend to be more prevalent in certain regions. This study also found a higher proportion of female patients than male patients, with a female/male ratio of 4.0/1. Other studies have found similar results. Based on Sheng Q (2017), there was a 15/3 female/male ratio [14]. A 29/6=4.83 female/male ratio was found in the study by Liu Y, et al [5]. Due to the prevalence of choledochal cysts in women, laparoscopic surgery is more relevant for aesthetic reasons. An average age of 3.55 was found. Other studies found similar results. There were 101 choledochal cysts reported by Huang CS, et al (2010). 42 were children (41.6%) and 59 were adults (58.4%). 3.7 years for children, 8.9 years for adults [15].

We performed all HJs using Roux-en-Y technique. The operation lasted between 100 and 320 minutes. Mean operative time was 214.7 ± 67.95 mins. Young children and infants present a special challenge to surgeons: minimizing operative time and maintaining results. Comorbidity rates will increase if surgery is too lengthy. Multiple factors are required to shorten the operating time, including competent surgeons, nurses, and anesthesiologists as well as adapted instruments. Laparoscopic procedures require a longer operative time at the beginning of their learning curve. Recent studies have also shown that the operating time of laparoscopic procedures is similar to that of open procedures. Based on the results of Liem NT (2012), the operative time for hepatoduodenal anastomosis was 164.8 minutes, while 220 minutes were required for hepatojejunal anastomosis [16]. According to Liu Y, et al., laparoscopic procedures took 249 minutes on average, compared to 132

minutes for open surgeries [5]. Blood can be transfused during laparoscopic excision of choledochal cysts. One patient had a perforated hepatic duct, three had hepatic duct transections, and four needed intraoperative blood transfusions. [16]. Tang ST, et al. Transfusions were required in 8 cases [17].

Early complications were noted in 6 out of 50 cases, including four cases of bile leakage and two cases of pancreatitis. Five of the cases were treated conservatively, which resulted in a complete resolution. In one case of persistent bile leakage, reoperation was finally required. A reoperative procedure was eventually required in one case of persistent bile leakage. Ono, et al. [18] described long-term complications of hepaticojejunostomy and choledochal cyst excision, including liver dysfunction, intrahepatic bile duct dilation, recurrent abdominal pain, and biliary tract malignancy. Anastomosis and dissection of the choledochal cyst can be easier with a laparoscopic approach. A report of postoperative bile leakage was reported in 39 patients by Liuming H (2011) [19]. Bile leakage was 1.6% in Acker SN (2013). Excision of choledochal cysts was safe but rarely associated with pancreatitis. An important risk factor for postoperative pancreatitis might be preoperative pancreatitis [20]. There were fewer early complaints in our study than in other studies. In order to reduce the rate of bile leakage, some authors provided several tips. It is also important to avoid overslicing the common hepatic duct. In addition, it is important to practice good laparoscopic suture technique. To construct a tension-free anastomosis, it is recommended to select bowel loops with good arterial arcades and sufficient length. As a final step, the anastomosis should be thoroughly examined before the operation is completed. In our study, we did not find any other complications such as pancreatic fistulas, incisional fluid collection. A 2 and a 3 year old patient had anastomotic stenosis. Rehospitalization was required due to intrahepatic lithiasis. This problem was resolved with an open operation and anastomotic redo. Due to the large number of patients who lost contact, we were

unable to analyze the long-term results. After discharge from the hospital, 90.5% of children continued to have good postoperative results after 3 months. The follow-up of nine patients was not completed. There are some limitations to our study. 3 months was the follow-up period, and the sample size was small. There was no comparison between laparoscopic choledochal cyst excision and Roux-en-Y hepatojejunostomy in children.

CONCLUSION

There was a feasibility and safety for Roux-en-Y hepaticojejunostomy and laparoscopic excision of choledochal cysts in children. Postoperative compliance, operative time, and hospital stay could all be improved. Most cases had good short-term outcomes.

REFERENCES

1. Soreide K, Korner H, Havnen J, Söreide JA (2004) Bile duct cysts in adults. *Br J Surg* 91: 1538-1548.
2. Tang W, Dong K, Liu G, Cui X, Zheng S (2015) The clinical characters of congenital choledochal cysts in perinatal patients: A retrospective analysis in a single institution. *Am J Perinatol* 32: 853-858.
3. Kayaalp C, Soyer V, Ersan V, Aydın C, Karagül S (2016) Laparoscopic choledochal cyst excision and Roux-en-Y hepaticojejunostomy. *Ulus Cerrahi Derg* 32: 152-154.
4. Diao M, Li L, Cheng W (2011) Laparoscopic versus open Roux-en-Y hepatojejunostomy for children with choledochal cysts: Intermediate-term follow-up results. *Surg Endosc* 25: 1567-1573.
5. Liu Y, Yao X, Li S, Liu W, Liu L, et al. (2014) Comparison of the therapeutic effects of laparoscopic and open operation for congenital choledochal cysts in adults. *Gastroenterol Res Pract*.
6. Liem NT (2013) Laparoscopic surgery for choledochal cysts. *J Hepatobiliary Pancreat Sci* 20: 487-491.
7. Duan X, Mao X, Jiang B, Wu J (2015) Totally laparoscopic cyst excision and Roux-en-Y hepaticojejunostomy for choledochal cyst in adults: A single-

- instituteexperienceof5years.SurgLaparosc Endosc Percutan Tech 25: e65-e68.
8. Xuan NT, Hiep PN, Thien HH, Vu PA, Thanh PH, et al. (2013) Laparoscopic excision of choledochal cyst in Hue Central Hospital. Vietnam Laparoscopic surgery and Endoscopy Journal 1: 22-25.
 9. Terblanche J, Worthley CS, Spence RA, Krige JE (1990) High or low hepaticojejunostomy for bile duct strictures? Surgery 108:828-834.
 10. Wiseman K, Buczkowski AK, Chung SW, Francoeur J, Schaeffer D, et al. (2005) Epidemiology, presentation, diagnosis, and outcomes of choledochal cysts in adults in an urban environment. Am J Surg 189: 527-531.
 11. Lee SE, Jang JY, Lee YJ, Choi DW, Lee WJ, et al. (2011) Choledochal cyst and associated malignant tumors in adults: A multicenter survey in South Korea. Arch Surg 146: 1178-1184.
 12. Choi SB, Choi SY (2016) Current status and future perspective of laparoscopic surgery in hepatobiliary disease. Kaohsiung J Med Sci 32: 281-291.
 13. Farello GA, Cerofolini A, Rebonato M, Bergamaschi G, Ferrari C, et al. (1995) Congenital choledochal cyst: Video-guided laparoscopic treatment. Surg Laparosc Endosc 5:354-358.
 14. Sheng Q, Lv Z, Xu W, Xiao X, Liu J, et al. (2017) Reoperation after cyst excision with hepaticojejunostomy for choledochal cysts: Our experience in 18 cases. Med Sci Monit 23:1371-1377.
 15. Huang CS, Huang CC, Chen DF (2010) Choledochal cysts: Differences between pediatric and adult patients. J Gastrointest Surg 14: 1105-1110.
 16. Liem NT, Pham HD, Dung le A, Son TN, Vu HM (2012) Early and intermediate outcomes of laparoscopic surgery for choledochal cysts with 400 patients. J Laparosc Adv Surg Tech A 22:599-603.
 17. Tang ST, Yang Y, Wang Y, Mao YZ, Li SW, et al. (2011) Laparoscopic choledochal cyst excision, hepaticojejunostomy, and extracorporeal Roux-en-Y anastomosis: A technical skill and intermediate-term report in 62 cases. Surg Endosc 25:416-422.
 18. Ono S, Fumino S, Shimadera S, Iwai N (2010) Long-term outcomes after hepaticojejunostomy for choledochal cyst: A 10-to 27-year follow-up. J Pediatr Surg 45:376-378.
 19. Liuming H, Hongwu Z, Gang L, Jun J, Wenying H, et al. (2011) The effect of laparoscopic excision vs open excision in children with choledochal cyst: A midterm follow-up study. J Pediatr Surg 46:662-665.
 20. Acker SN, Bruny JL, Narkewicz MR, Roach JP, Rogers A, et al. (2013) Preoperative imaging does not predict intrahepatic involvement in choledochal cysts. J Pediatr Surg 48:2378-2382.