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Outcomes of Complete Excision and Roux-en-Y Hepaticojejunostomy for Choledochal Cysts: A Single-Center Experience

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ABSTRACT

Background: Choledochal cyst is a developmental abnormality of the biliary tract that is related to repeated cholangitis, pancreatitis, biliary cirrhosis, and malignancy. The treatment of full cyst removal and Roux-en-Y hepaticojejunostomy is assumed to be the most effective, but the outcome can differ in children and adults because of the variation in the evolution of the disease and inflammatory alterations. **Objective:** To evaluate surgical and functional outcomes of complete excision and Roux-en-Y hepaticojejunostomy for choledochal cysts in pediatric and adult patients at a single tertiary care center. **Methodology:** The study involved a descriptive observation, which was carried out in Organ Transplant Unit, Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences/ Gambat Medical College, Gambat, District Khairpur Mir's, between May 2024 and May 2025. A total of 55 patients of all age groups who were diagnosed with choledochal cyst underwent total cyst excision and then Roux-en-Y hepaticojejunostomy. Clinical findings before operation, radiological categorization, variables during operation, early postoperative complications, and late outcome were noted down. The comparison was performed through the proper statistical tests with $p < 0.05$ as the significant value in pediatric and adult groups. **Results:** Among 55 patients, 29 (52.7%) were pediatric and 26 (47.3%) were adults, with female predominance (65.5%). Type I cyst was the most common subtype (76.4%). Adults presented more frequently with cholangitis and had higher bilirubin levels ($p<0.05$). Operative time and blood loss were significantly greater in adults. Early postoperative complications occurred in 29% of patients, most commonly surgical site infection and bile leak. Hospital stay was longer in adults ($p=0.001$). During follow-up, anastomotic stricture occurred in 9.1% and recurrent cholangitis in 12.7%, mainly in adults. **Conclusion:** Complete excision with Roux-en-Y hepaticojejunostomy is a safe and effective treatment for choledochal cysts. Early surgical intervention, particularly in pediatric patients, is associated with better outcomes and fewer long-term complications.

INTRODUCTION

Choledochal cyst is a congenital expansion of the biliary tree that can involve either the extrahepatic or intrahepatic or both of the bile ducts. The disease is more commonly found to be reported in the Asian populations and is heavily predominant in females. It is traditionally a disease of childhood but more and more cases are diagnosed in the adult age as a result of better imaging techniques like ultrasonography and magnetic resonance cholangiopancreatography (MRCP). Clinical presentation is wide-ranging as in children some may present with jaundice and an abdominal mass whereas in adults; it may manifest as abdominal pain, cholangitis and pancreatitis [1-3].

Choledochal cyst pathogenesis has usually been associated with the pancreaticobiliary maljunction; this enables the reflux of the pancreatic enzyme to the biliary tree and inflammatory events, damage to the epithelium, and ductal progressive dilatation. Long-term inflammation places the patients at risk of complications such as frequent infections, biliary stones, secondary biliary cirrhosis, portal hypertension and malignant transformation especially cholangiocarcinoma. Clinical significance of early diagnosis is that delay in treatment and age is associated with the increased risk of malignancy [4-6].

Traditionally, cyst-enterostomy and other drainage were the procedures used that had a high recurrence rate, formation of stones and a likely risk of cancer because of the remaining cyst mucosa. In modern surgical practice, full resection of the cyst in conjunction with biliary reconstruction, the latter being most frequently Roux-en-Y hepaticojejunostomy, is necessary to eliminate the

diseased epithelium, and restore physiological production and flow of bile. The strategy has greatly enhanced the long term results and minimized risks of malignancy [7-9].

Although the surgical treatment is standardized, the result of postoperative effects in children and adults might be different due to late recurrence of inflammation and fibrosis in adults, which complicates the surgery process and raises the probability of postoperative complications. There is little local information on the outcomes of this procedure among mixed age groups. Therefore, this study aimed to evaluate the surgical and functional outcomes of complete excision with Roux-en-Y hepaticojejunostomy for choledochal cysts at a tertiary care center and to compare results between pediatric and adult patients.

METHODOLOGY

It was a descriptive observational study that was carried out at the Organ Transplant Unit, Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences/ Gambat Medical College, Gambat, District Khairpur Mir's, between May 2024 and May 2025. The researchers compared the outcome of total excision of choledochal cyst with Roux-en-Y hepaticojejunostomy in children and adults.

Fifty-five patients with choledochal cyst identified on the imaging were included. Non-probability consecutive sampling was used to enroll patients who had had definitive, surgical management in the study center regardless of age or gender. The number of cases was both elective and stabilized emergency cases. Patients with incomplete records, those who went through palliative drainage procedures in other locations, and those who were lost to follow-up shortly after an operation were excluded.

This involved preoperative assessment in all patients such as a clinical assessment, liver tests, serum amylase/lipase, and radiological tests. All patients underwent ultrasound abdomen and MRCP was done to verify the diagnosis and classify the cyst as per Todani classification. Patients showing up with cholangitis were first stabilized using antibiotics and biliary decompression where necessary prior to definitive surgery.

All the surgeries were carried out by consultant hepatobiliary surgeons under general anesthesia. Its operating method involved total excision of the extrahepatic cyst, cholecystectomy and Roux-en-Y hepaticojejunostomy. The Roux limb was kept at 40-60 cm depending on the size of the patient. All cases had a drain close to the anastomosis. The time of operation, losing of blood and complications in the course of operations were documented.

The early complications such as bile leak, surgical site infection, intra-abdominal collection, cholangitis, pancreatitis were monitored in the postoperative. The length of stay in a hospital and ICU required were recorded. Follow-up was done at outpatient clinics at the end of their treatment and late outcomes such as anastomotic stricture, recurrent cholangitis, formation of stones and re-intervention requirements were observed.

Data were entered and analyzed using SPSS version 26. Quantitative variables such as age, operative time, blood loss, and hospital stay were expressed as mean ± standard deviation. Qualitative variables were presented as frequencies and percentages. Pediatric and adult groups were compared using independent sample t-test for continuous variables and Chi-square test for categorical variables. A p-value ≤0.05 was considered statistically significant.

RESULTS

A total of 55 patients underwent complete excision of choledochal cyst with Roux-en-Y hepaticojejunostomy at PAQSJIMS, Gambat during the study period. Among them, 29 (52.7%) were pediatric (<18 years) and 26 (47.3%) were adults. Female predominance was observed (65.5%). Abdominal pain and jaundice were the most common presenting complaints. Type I choledochal cyst was the predominant radiological type.

In children, abdominal mass and jaundice were more frequently observed and in adults, more frequently, it was pain and cholangitis. The commonest one was type I cyst in both groups. Adults had a much higher cholangitis and bilirubin levels ($p < 0.05$).

Table 1

Baseline Demographic, Clinical and Radiological Characteristics

Variable	Pediatric (n=29)	Adult (n=26)	Total (n=55)	p-value
Mean Age (years)	8.6 ± 4.2	32.4 ± 11.8	19.9 ± 14.3	—
Female	18 (62.1%)	18 (69.2%)	36 (65.5%)	0.58
Abdominal pain	14 (48.3%)	22 (84.6%)	36 (65.5%)	0.006
Jaundice	20 (69.0%)	12 (46.2%)	32 (58.2%)	0.04
Cholangitis	5 (17.2%)	14 (53.8%)	19 (34.5%)	0.003
Pancreatitis	2 (6.9%)	5 (19.2%)	7 (12.7%)	0.16
Type I cyst	23 (79.3%)	19 (73.1%)	42 (76.4%)	0.59
Type IVa cyst	6 (20.7%)	7 (26.9%)	13 (23.6%)	0.59
Mean Total Bilirubin (mg/dL)	3.8 ± 2.1	6.4 ± 3.5	5.0 ± 3.0	0.01

Most patients underwent open surgery. The operative time of the adults was much longer and the amount of blood loss was also much high ($p < 0.05$). There were rare cases of intraoperative complications.

Table 2

Operative Findings

Variable	Pediatric (n=29)	Adult (n=26)	Total	p-value
Open surgery	25 (86.2%)	23 (88.5%)	48 (87.3%)	0.79
Laparoscopic	4 (13.8%)	3 (11.5%)	7 (12.7%)	—
Operative time (min)	158 ± 32	192 ± 41	174 ± 39	0.002
Blood loss (ml)	78 ± 30	132 ± 45	104 ± 46	0.001
Transfusion required	2 (6.9%)	5 (19.2%)	7 (12.7%)	0.15
Intraoperative complication	1 (3.4%)	3 (11.5%)	4 (7.3%)	0.23

Most cases showed uneventful postoperative recovery. The most common complications were bile leak and surgical site infection. Adults experienced more complication and did not have statistically significant differences except hospital stay ($p < 0.05$).

Table 3
Early Postoperative Outcomes (≤30 days)

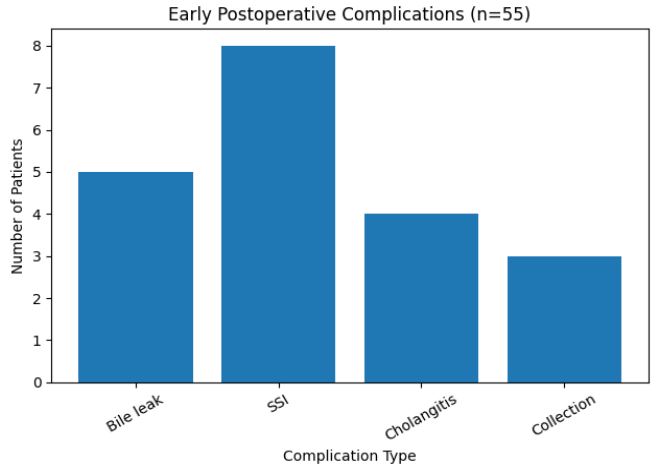
Outcome	Pediatric (n=29)	Adult (n=26)	Total	p-value
Hospital stay (days)	6.1 ± 1.8	8.4 ± 2.7	7.2 ± 2.5	0.001
ICU admission	3 (10.3%)	5 (19.2%)	8 (14.5%)	0.32
Bile leak	2 (6.9%)	3 (11.5%)	5 (9.1%)	0.53
SSI	3 (10.3%)	5 (19.2%)	8 (14.5%)	0.32
Cholangitis	1 (3.4%)	3 (11.5%)	4 (7.3%)	0.23
Intra-abdominal collection	1 (3.4%)	2 (7.7%)	3 (5.5%)	0.46

Mean follow-up duration was 11.2 ± 3.6 months. Anastomotic stricture and recurrent cholangitis occurred mainly in adults. Overall long-term outcome was satisfactory with low re-intervention rate.

Table 4
Late Outcomes During Follow-up

Outcome	Pediatric (n=29)	Adult (n=26)	Total	p-value
Anastomotic stricture	1 (3.4%)	4 (15.4%)	5 (9.1%)	0.12
Recurrent cholangitis	2 (6.9%)	5 (19.2%)	7 (12.7%)	0.15
Stone formation	0	2 (7.7%)	2 (3.6%)	0.13
Re-intervention	1 (3.4%)	4 (15.4%)	5 (9.1%)	0.12
Malignancy	0	0	0	—

Figure 1
Distribution of Early Postoperative Complications Following Complete Excision and Roux-en-Y Hepaticojejunostomy (n=55)



Surgical site infection was the most frequent complication, followed by bile leak, cholangitis, and intra-abdominal collection.

DISCUSSION

Choledochal cyst is a rare genetic defect of the biliary system with already known high risk of repeated cholangitis, pancreatitis, cholestatic cirrhosis of the liver, and metastatic change without a final cure. The gold standard procedure is complete cyst resection and Roux-en-Y hepaticojejunostomy as it removes the abnormal biliary epithelium and recreates the occurrence of physiological drainage of bile. The current single center experience of PAQSJIMS Gambat showed good surgical and functional results in children and adults [10-13].

A strong female preponderance (65.5%) was found in our study, which is in line with the established epidemiology of choledochal cyst disease where females are more prone to the disease as compared to males. In pediatric patients, the most common presentations were jaundice and abdominal mass, but in adults, abdominal pain and cholangitis were the most common. Such presentation disparity is based on the natural history of the disease; since children are normally diagnosed earlier based on obstructive complications, the later diagnosis in adults results in inflammatory complications and recurrent infections of the biliary ducts. The clinical progression is supported by higher levels of bilirubin in the blood and cholangitis in the adults in our cohort [14-16].

The most common subtype in our series was Type I cyst (76.4%), then Type IVa, as it is the case with the global distribution with Type I predominating. The increased inflammatory load in adult patients also predetermined the much longer operating period and the increased intraoperative blood loss in this demographic. In chronic inflammation and dense adhesions of long term disease, dissection may be more technically challenging than otherwise, and has also been described in the literature of hepatobiliary surgery [17-20].

In our cohort, the initial postoperative results were good. The general complication rate was low, and the most prevalent events were surgical site infection and bile leak. Notably, the majority of bile spillage was insignificant and could be treated with a conservative approach. The duration of hospital stay was much greater in adults, which once more revealed more progressive disease and postoperative recovery. Overall, the procedure demonstrated a favorable safety profile when performed in a specialized hepatobiliary unit.

The follow-up (Long-term) indicated that there was a minor percentage of patients developing anastomotic stricture and recurrent cholangitis which were majorly in adults. Probably contributing factors are chronic inflammation, fibrosis of the hepatic duct margins and late presentation. It was found that no malignancy developed on the follow-up period, which supports the protective effect of complete cyst excision in the prevention of cholangiocarcinoma. Pediatric patients had better long-term success, and it is critical to diagnose early and have surgery.

Overall, our results confirm the fact that early surgical intervention leads to better recovery, the decreased number of complications, and the enhancement of biliary functioning. Adults are more perioperative and late complications because of an extended course of illnesses. Hence early referral and conclusive management is essential.

CONCLUSION

Complete excision of choledochal cyst with Roux-en-Y hepaticojejunostomy is a safe and effective definitive treatment. Pediatric patients show better postoperative recovery and fewer late complications compared to adults. Delayed presentation in adults is associated with more difficult surgery. Early diagnosis and timely surgical intervention significantly improve outcomes and should be emphasized in clinical practice.

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