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Early Outcome of Laparoscopic Choledochal Cyst Excision with Roux-N-Y Hepaticojejunostomy

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ABSTRACT

Background: Laparoscopic surgery has replaced conventional surgery due to its efficacy and safety. It offers a minimally invasive alternate to open surgery with faster recovery, lesser pain and complications. Choledochal cyst, a congenital disease, poses a significant challenge for the surgeon due to its complex anatomy and variations. Excising the cyst laparoscopically can significantly aid in reducing the morbidity associated with it.
Objective: The purpose of this study is to share our results of Laparoscopic Choledochal Cysts excision in terms of per-operative and early post-operative complications, in a tertiary care hospital.
Materials and Methods: The study is based on prospective analysis and review of a cohort of 27 patients having age ranging from 18-60 years. These patients underwent laparoscopic choledochal cyst excision at Department of surgery, Hayatabad Medical Complex Pakistan, during 2022-23. The demographic details, intra-operative characteristics and postoperative outcomes were examined and analyzed. Statistical analyses were conducted by using IBM SPSS 25.0.
Results: The study revealed a significant success rate of 92.6%. Intra-operative blood loss and excision time were within the standard parameters. Post-operative complications included fever (22.2%), upper respiratory tract infection (14.8%), and abscess formation (7.4%). Time to oral feeding was 3.91±1.11 days, and the mean postoperative hospital stay was 5.71±2.01 days. The mortality rate during the three-months follow-up was reported as zero.
Conclusion: Laparoscopic choledochal cyst excision proves to be a suitable and less invasive alternative, with positive early outcomes. The study supports the contemporary shift toward laparoscopic interventions having reduced complications and speedy recovery of the patient.
Keywords: Choledochal cyst, Early outcomes, Hepatobiliary surgery, Laparoscopic excision, Minimally invasive, Postoperative complications.

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INTRODUCTION

Choledochal cysts are described as rare congenital anomalies characterized by cystic dilatation of the biliary tree. This presents as a challenging problem in the area of pediatric and adult hepatobiliary surgery. The condition, in which both intra and/or extrahepatic bile ducts dilate is associated with various complications including recurrent cholangitis, pancreatitis and increased risk of malignancy.[1] These cysts have a wide range of presentations and complicated anatomy and are classified in to various types by the Todani Classification System (TCS).[2] On the basis of appearances, they are ranging from fusiform dilatations to diverticular outpouchings that emphasizes the need for more understanding of their pathology and expert utilization of appropriate treatment options.[3,4]

Surgical management is generally considered as the mainstay for treating choledochal cysts; which has been recognized to lower complications and improve long-term results.[5] The risk of malignancy in these cysts particularly in the adult patients, further emphasizes the necessity of prompt surgical intervention in these patients.[6] If left untreated, this congenital anomaly can lead to progressive liver decompensation over time, recurring cholangitis and increased risk for biliary cancers.[7]

Over the last decade, laparoscopic techniques have completely revolutionized the field of surgery. Using laparoscopic choledochal cyst excision in the surgical theatre could deliver a promising strategy for potential future operations that follow open standards. This intervention may be beneficial in a subset of high-risk patients for surgery. This has many benefits, which include a decrease in the pain after surgery, reduced hospital stays (based on patient length of stay) and improved cosmesis.[8,9] Besides, it is also useful in taking biopsies as well. In order to adopt the laparoscopic excision method, it is necessary to understand its early outcomes to validate its effectiveness and safety in comparison to the conventional open technique.

The purpose of this study is to add to the evolving understanding of choledochal cysts and their therapy, with a particular emphasis on assessing the early outcomes following laparoscopic choledochal cyst excision. These investigations are required since there is limited literature on early complications after laparoscopic procedure in patients with choledochal

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cysts. Here, we expect that the present study will bridge this gap and increase the potential efficacy of surgery for this complex biliary abnormality to result in an improvement of patient outcomes.

MATERIALS AND METHODS

This was a Prospective cohort study. Ethical considerations were addressed through approval from the Institutional Review Board under reference # 1797, dated 6-5-2024, with all participants providing informed consent. This study was conducted in department of Surgery, Hayatabad Medical Complex, Peshawar, Pakistan. This study was conducted from 1st November 2022 till 31st October 2023. The sample size of 27 patients was calculated using the formula for cohort studies, with a confidence level of 95%, power of 80%, and an estimated prevalence of choledochal cyst in the population of 0.01%, accounting for a dropout rate of 10%.[5]

Operational Definition

Choledochal cyst: Choledochal cysts are congenital anomalies of the biliary tree characterized by cystic dilatations of the intrahepatic and/or extrahepatic bile ducts, classified into five types based on the Todani system. They are more common in females and prevalent in East Asian populations. Clinical presentation includes abdominal pain, jaundice, and, in some cases, a palpable mass, with complications such as biliary obstruction, recurrent cholangitis or pancreatitis, and a significantly increased risk of cholangiocarcinoma. Diagnosis relies on imaging modalities like ultrasound, MRCP, and CT, which provide detailed visualization of biliary anatomy.[6]

All patients aged between 18 and 60 years with a confirmed diagnosis of choledochal cyst were included in this study. Patients with a history of previous abdominal surgeries, ASA III or above, pregnant, or those unwilling or unable to provide informed consent were excluded from the study.

Data Sources/Measurements: Patients were admitted through OPD. Choledochal cysts are congenital anomalies of the biliary tree characterized by cystic dilatations of the intrahepatic and/or extrahepatic bile ducts, classified into five types based on the Todani system. They are more common in females and prevalent in East Asian populations. Clinical presentation includes abdominal pain, jaundice, and, in some cases, a palpable mass, with complications such as biliary obstruction, recurrent cholangitis or pancreatitis, and a significantly increased risk of cholangiocarcinoma. Diagnosis relies on imaging modalities like ultrasound, MRCP, and CT, which provide detailed visualization of biliary anatomy. Surgical excision with biliary reconstruction, typically via Roux-en-Y hepaticojejunostomy, is the definitive treatment, with laparoscopic approaches increasingly used. Early intervention is essential to prevent complications and reduce the risk of malignancy.

Surgical Technique

The surgical procedure followed a standardized protocol. Patients were positioned supine with legs apart to facilitate surgeon access. Trocar placement involved a standard 4-port technique, with a 10 mm trocar below the umbilicus for the camera and three 5 mm trocars in strategic locations for working instruments. After establishing a pneumoperitoneum, the abdominal cavity was explored, and the choledochal cyst was dissected free from surrounding structures. Attention was meticulously given to preserving the main bile duct to minimize complications. Following liberation, the cyst was resected, ensuring clear margins based on the type of choledochal cyst. Reconstruction involved creating a hepaticojejunostomy using a Roux-en-Y limb of the jejunum, with anastomosis performed in an end-to-side fashion using absorbable sutures. Closure included thorough hemostasis and layered closure of trocar sites, with routine placement of a sub hepatic drain.

Postoperatively, patients were closely monitored in the post-anesthesia care unit and subsequently on the surgical ward. Prophylactic antibiotics were administered, and oral intake was allowed upon resumption of bowel function. Discharge criteria were predefined and discharged accordingly. Follow-up included regular visits at 1 week, 1 month, and 3 months postoperatively, with additional visits scheduled based on clinical indications. Outcome measures encompassed operative time, intra-operative and post-operative complications, length of hospital stay and overall patient satisfaction.

Statistical analyses were performed using IBM SPSS version 25.0, with significance set at $p \leq 0.05$. Continuous variables were summarized as means or medians based on normality, while categorical data were presented as frequencies and percentages.

RESULTS

Total 27 patients were enrolled. Age ranged between 18-60 years, with a mean of 40.2±12.3. There were 17(63%) males and 10(37%) females, with male to female ratio of 1.7:1. Among 27 patients, 8(29.6%) presented with a palpable mass, 7(25.9%) manifested symptoms of cholangitis, 9(33.4%) had pancreatitis and 3(11.1%) had stone in CBD. The mean cyst diameter measured 5.6±1.21cm. The duration of symptoms exhibited a range of 2-4 months with a mean of 2.8±0.83 months prior to surgical intervention. Diagnostic assessments revealed that 9 (33.4%) cases were identified through ultrasonography, while 18 (66.6%) cases were diagnosed via Magnetic Resonance Cholangiopancreatography (MRCP).

Table 01. Demographic details

Parameter	Frequency	Percentage(%)
Male	17	63
Female	10	37
Palpable mass	8	29.6
Cholangitis	7	25.9
Pancreatitis	9	33.4
CBD stone	3	11.1
U/S	9	33.4
MRCP	18	66.6
Mean±SD		
Age (mean±SD) in years	40.2±12.3	
Mean cyst diameter (mean±SD) in cm	5.6±1.21	
Duration of symptoms (mean±SD) in months	2.8±0.83	

Intraoperative parameters revealed pericystic adhesions in 3(11.1%) patients. Only 2(7.4%) patients necessitated conversion to open procedure due to challenging pericystic adhesions, resulting in a commendable success rate of 25(92.6%). The mean intraoperative blood loss was 85.11±21.41 ml. The mean time for cyst excision was 92.22±17.91 min.

Table 02. Intra-operative characteristics

Characteristics	Frequency	Percentage(%)
APericytic adhesions	3	11.1
Conversion to open	2	7.4
Success rate	25	92.6
Intra-op blood loss (mean±SD) in ml	85.11±21.41	
Time to cyst excision (mean±SD) in minutes	92.22±17.91	

Postoperative fever was noted in 6(22.2%) cases, followed by upper respiratory tract infection 4(14.8%) and abscess formation in 2((7.4%). Time to start oral feed was 3.91±1.11 days and mean length of postoperative hospital stay was recorded as 5.71±2.01. No mortality was recorded during the study period. Table-3

Table 03. Study outcome

Outcome	Frequency	Percentage(%)
Fever	6	22.2
Upper respiratory tract infection	4	14.8
Abscess formation	2	7.4
Oral feeding (mean±SD) in days	3.91±1.11	
Length of stay (mean±SD) in days	5.71±2.01	
Mortality	0	

DISCUSSION

Our study demonstrates that laparoscopic choledochal cyst excision with Roux-en-Y hepaticojejunostomy is a safe and effective procedure, with favorable short-term outcomes, including no major complications, a smooth post-operative recovery, and successful resolution of symptoms. These findings underscore the efficacy of laparoscopic surgery in achieving the dual goals of definitive cyst removal and restoration of biliary continuity while offering the advantages of minimally invasive techniques, such as reduced pain, quicker recovery, and better cosmesis.

Our cohort had a male to female ratio and age distribution that was consistent with previously reported demographic data.[10-12] Preoperative imaging primarily utilized MRCP, which proved to be a valuable diagnostic tool, aiding in surgical planning. This emphasizes the importance of accurate preoperative imaging in achieving favorable outcomes. In our study, the overall success rate of 92.6% (with only 7.4% needing conversion to open) was excellent. We were in the line, if not less than others of same statistics for conversion rate.[13,14] The mean blood loss and cyst removal time of surgery in current study was within the acceptable range which could further affirm that laparoscopic intervention is a highly efficacious method.[15,16]

Postoperative results were used to evaluate the efficacy and safety of laparoscopic choledochal cyst excision in this study. Fever, URTI-related postoperative complications and abscess formation were few of the common expected short-term consequences following operation but with low numbers. In contrast to the above literatures we have earlier start of oral intake and discharge postoperative hospital stay in our cases. Lastly no death was reported during this era of our research which is also well corroborated with the other studies showing overall safe outcome in terms of laparoscopic choledochal cyst excision.[17-18]

In the context of minimally invasive surgery, the advantages of laparoscopy over open approaches are increasingly evident. Reduced postoperative pain, better cosmetic outcomes, and faster recovery are well-documented benefits of laparoscopic interventions, and our study's findings align with this growing body of evidence. Moreover, the absence of major complications further validates the efficacy of this surgical approach, making it a viable option for the treatment of choledochal cysts.

Strengths & Limitations

This study demonstrates the feasibility and safety of laparoscopic choledochal cyst excision with Roux-en-Y hepaticojejunostomy, showcasing favorable short-term outcomes such as minimal complications, successful symptom resolution, and rapid recovery, underscoring the advantages of a minimally invasive approach over open surgery. However, as a single-center analysis with a relatively small sample size, the findings may not be generalizable to broader populations, limiting the robustness of the conclusions. Additionally, the three-month follow-up period is too short to assess long-term outcomes such as recurrence or delayed complications. Another limitation is the inability to analyze choledochal cyst subtypes in detail, as variability in preoperative imaging diagnoses posed challenges for classification.

Future study prospects

Future research should aim to address these limitations by conducting multicenter studies with larger sample sizes and longer follow-up periods to evaluate the sustainability of outcomes and recurrence risks. Moreover, detailed classification and analysis of choledochal cyst types using advanced imaging techniques could provide deeper insights into the outcomes of laparoscopic treatment, contributing to the refinement of surgical strategies and broader clinical applicability.

CONCLUSION

This study of ours on laparoscopic choledochal cyst excision gives an encouraging feeling that this technique could be safely applied in treatment for complicated congenital anomalies. Totally laparoscopic surgery had 92.6% success rate, a very low number of intraoperative-associated complications and inverse trend in convalesce after the surgical procedure that could represent advantages. The intraoperative benefits, few post-operative pain and quicker length of stay lend to this philosophy for minimally invasive procedures. These results have important impact on management of choledochal cysts and provide support for the universal use of laparoscopy over open approaches. We, therefore studied the initial results of Laparoscopic choledochal cyst excision in hepatobiliary surgery. The findings of this study will be a basis for further investigation and advancement in the surgical technique to aid patients suffering from choledochal cyst.

Ethical Consideration

This study was approved by Institutional Review Board of Hayatabad Medical Complex, Peshawar, Pakistan.

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Conflict of Interest

Authors declared no conflict of interest.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHORS' CONTRIBUTION

The following authors fulfill authorship criteria as per ICMJE guidelines;

Khan MB, Iftikhar M: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.

Ahmad S, Shahana N: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

Aslam R, Alam M: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.

Rehman K: Analysis and interpretation of data, critical revision, final approval, agreed to be accountable for all the work.

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