

Original Research Article

Assessment of the outcomes of open side-to-side choledochoduodenostomy in the management of choledocholithiasis

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ABSTRACT

Background: Gallstone disease is one of the most common digestive diseases leading to frequent hospital visits and its prevalence shows ethnic variability, with rates of approximately 10-15% in the United States and Europe. The present study aims to prospectively assess the outcomes of open side-to-side choledochoduodenostomy in the management of choledocholithiasis.

Methods: This hospital-based prospective observational study was conducted in the Department of Surgery, Tezpur medical College and Hospital, Tezpur, over one year period, from July 2021 to June 2022. The study includes twenty-four patients admitted to the surgery department for bile duct stone operations. After intraoperative confirmation of the criteria, these patients underwent choledochoduodenostomy. The patients were followed for 2 months postoperatively after discharge.

Results: Only a few patients had immediate postoperative complications which were managed conservatively. No patient had any evidence of retained stone, nor did they have any symptoms of cholangitis, features suggestive of the development of Sump syndrome, or any other follow-up postoperative complications.

Conclusion: Open side-to-side choledochoduodenostomy should be considered a method of choice in remote areas where endoscopic facilities are lacking and in patients where cost is a factor in deciding the choice of procedure, with reduced postoperative complications like retained stones and a shorter duration of hospital stay in expert surgical hands.

Key Words: Cholangitis, Choledochoduodenostomy, Choledocholithiasis, Common bile duct, Sump syndrome

INTRODUCTION

Gallstone disease is one of the most often diagnosed gastrointestinal conditions globally. The incidence of choledocholithiasis, the second most frequent consequence of gallbladder stone disease, rises with age. According to the research, the prevalence of common bile duct stones (CBDS) in individuals with symptomatic cholelithiasis ranges considerably between 5% and 33% depending on age.^{1,2} CBD stones can also be primary in some situations which may be formed post

cholecystectomy, infection of the biliary tree, infestation by parasites, or associated blood disorders. Many a time CBD stones may be clinically silent or asymptomatic. The European Association for Endoscopic Surgery (EAES) recommends that all patients with symptomatic gallstones be assessed for the presence of CBD stones and treated based on the patient's risk classification.^{3,4} Pre-operative non-invasive diagnostic imaging techniques include trans-abdominal ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP). However, the most popular invasive method for its identification is

Endoscopic Retrograde Cholangiopancreatography (ERCP). It is advised to get treatment to avoid additional complications like pancreatitis, acute cholangitis, and obstructive jaundice.^{5,6} There are numerous treatment options, ranging from open and minimally invasive surgery to endoscopic methods. But open surgeries including choledochoduodenostomy will still be required in centres where there is no expertise or facility or in cases of failed ERCP or laparoscopic exploration of CBD. The gold standard for the treatment of choledocholithiasis continues to be cholecystectomy with an exploration of the common bile duct (CBD). The risk of residual stones and recurrent stones, which may necessitate additional intervention and increase the morbidity and mortality of the patients, should be tried with proper CBD drainage.⁷ An established method for internal CBD drainage is side-to-side choledochoduodenostomy (CDD), which is recommended when there are multiple common duct calculi or biliary sludge in a dilated duct.⁸⁻¹⁰ There are, however, some controversies regarding the development of long-term complications.⁹⁻¹² The present study aims to assess the postoperative outcomes of open side-to-side choledochoduodenostomy in the management of choledocholithiasis.

METHODS

The present hospital-based prospective observational study was conducted in the Department of Surgery, Tezpur Medical College and Hospital, Tezpur, over one year period, from July 2021 to June 2022. Ethical clearance was obtained from the Institutional Ethics Committee. The study includes twenty-four patients admitted to the Surgery Department for bile duct stone operations. Patients with a dilated CBD (>12 mm) with multiple stones, intrahepatic lithiasis, significant biliary sludge, or a distally impacted bile duct stone are included in the study. Patients not fit for surgery, stones associated with malignancy of the Hepato-Pancreatico-Biliary system, CBD diameter less than 12 mm, and pregnant women are excluded from the study. Complete details of the patients were recorded including medical history and clinical examination findings. Routine blood investigations including liver function tests, viral markers, and ultrasound of the abdomen were done in all the patients. All patients whose USG revealed dilated CBD were advised to have an MRCP (done in 22 patients) for further evaluation and CECT abdomen was done wherever necessary. Then, patients were planned for CBD exploration after a pre-anaesthetic check-up, and the final decision for choledochoduodenostomy was taken intraoperatively. Consent of the patient/guardian regarding the possibility of CDD procedure upon them was taken and preoperative preparation was done. All patients were operated on under general anaesthesia. All patients in the study underwent open cholecystectomy as a preliminary procedure, except those with a prior cholecystectomy. Cholecystectomy was performed in 19 cases (79.17%). The rest of the cases were post-operative cases of cholecystectomy. The choice of drainage technique for the

CBD was decided after the patients were examined intraoperatively and the radiological results were confirmed.



Figure 1: Image showing stone being extracted from CBD (Source: Operation Theatre, Department of Surgery, TMCH).

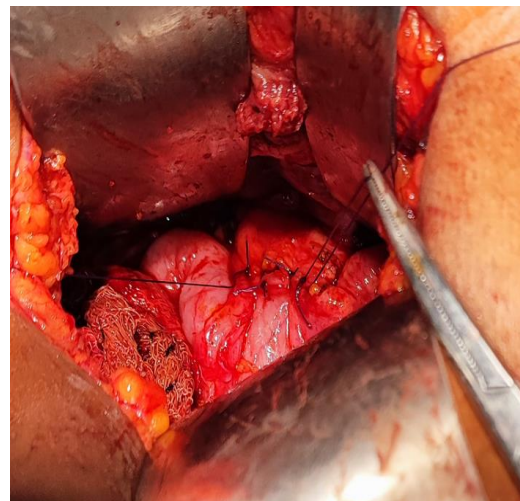


Figure 2: Intraoperative image showing anastomosis in side-to-side choledochoduodenostomy (Source: operation theatre, department of surgery, TMCH).

Patients with a CBD dilation of at least 12 mm, recurrent/retained stones, multiple stones, or a lower impacted CBD stone with considerable sludge were selected for CDD. A Kocher manoeuvre was performed to free the duodenum's lateral margin to achieve maximum mobility. Two traction sutures were placed on either side of the midline in the anterior wall of the CBD by 3-0 catgut. The CBD is longitudinally opened with a scalpel at the supraduodenal portion for about 2-2.5 cm. The CBD incision is made along the long axis of the bile duct as close to the duodenum as possible to prevent stenosis. The bile duct was cleared of stones using Desjardin's Choledocholithotomy forceps. Next, the bile duct was irrigated with normal saline to remove any remaining stones or debris and an infant feeding tube is passed to

check its patency. Perpendicular to the choledochotomy, a longitudinal duodenotomy is made close to the bile duct along the long axis of the duodenum. This incision is made a little smaller than the CBD incision. A traction suture was passed through the middle portion of the duodenal incision and the lower angle of the CBD incision. The other two traction sutures were passed through either end of the incision in the duodenum. The anastomosis was performed with an interrupted suture by 3-0 Polyglactin 910. Interrupted sutures were placed between the duodenum and bile duct at 2-3 mm intervals, forming the posterior wall. All sutures were tied and then cut, except the angle sutures. An interrupted row of 3-0 Polyglactin 910 sutures concluded the anterior anastomosis. Thus, a triangulated anastomosis was created between the CBD and the duodenum with a stoma of approximately more than 2 cm to facilitate biliary tract drainage. After securing the haemorrhagic points and placing the Sub-Hepatic Drain of size 24 FG, the abdominal cavity was closed in layers. Any postoperative discomfort like the severity of pain, nausea or vomiting, distension of the abdomen, or fever was recorded and managed symptomatically. Patients were usually discharged one to two days after alternate stitch removal. The patients were advised to visit the Surgery Outpatient Department for their initial check-up 7 days after discharge. They were then followed up at 1 and 2 months postoperatively. After two months, USG was repeated for evaluation of biliary enteric anastomotic conditions, retained stones, and possible complications like sump syndrome. Microsoft Word and Excel were used to generate tables and graphs, and statistical software IBM® SPSS 29.0.0.0 was used to analyse the data.

RESULTS

The study includes 24 patients in whom choledochoduodenostomy was performed, and the following observations were noted.

Table 1: CBD diameter in USG.

CBD diameter (mm)	N	%
12--15	12	50
16-19	8	33.3
20-23	4	16.7
>23	0	0
Total	24	100

Table 2: CBD diameter in MRCP (MRCP not done in two patients).

CBD diameter (mm)	N	%
12-15	10	45.5
16-19	7	31.8
20-23	4	18.2
>23	1	4.5
Total	22	100.0

The results and the observations were incorporated in a tabulated form in the master sheet. In the present study of

24 cases, the number of male patients was 6 (25%), and the number of female patients was 18 (75%).

Table 3: The values of preoperative blood investigations in CBD calculi patients.

Laboratory investigations	Mean	Range (min-max)	Upper normal
Total leucocytic count (cells/μl)	9.67 \times 103	(4.9 \times 103) - (21 \times 103)	11 \times 103
Total serum bilirubin (mg/dl)	3.01	0.5-5.8	1.3
Conjugated bilirubin (mg/dl)	2.33	0.3-4.6	0.3
SGOT (IU/l)	44.00	18-98	59
SGPT (IU/l)	46.79	29-134	50
Serum albumin (g/l)	3.66	1.9-4.8	5.5
Alkaline phosphatase (IU/l)	174.13	49-310	126

Table 4: The intra-operative findings of the patients in the study.

Final diagnosis	N	%
Cholelithiasis + choledocholithiasis	15	62.5
Choledocholithiasis	6	25
Cholelithiasis + choledocholithiasis + hepaticolithiasis	1	4.2
Choledocholithiasis + hepaticolithiasis	2	8.3
Total	24	100

Table 5: The duration of operation.

No. of patients (n)	Minimum (mins)	Maximum (mins)	Mean (mins)	SD (mins)
24	95	170	108.54	17.41

The male-female ratio was found to be 1:3. Most of the patients belonged to the age group of 41-50 years. The mean age of patients with choledocholithiasis was found to be 49.21 \pm 10.07 years ranging from 36-72 years.

Table 6: Immediate post-operative complications.

Immediate postoperative complications	N	%
Wound infection	2	8.33
Fever	3	12.5
Biliary leakage	1	4.2
Abdominal distension	1	4.2
Intraabdominal abscess	0	0.0
Septicemia	0	0.0

The most common symptom that the patients came with was pain in the right upper abdomen in 87.5% (21 cases) of the patients.

Table 7: The duration of Postoperative hospital stay.

No. of patients (n)	Minimum (days)	Maximum (days)	Mean (days)	SD (days)
24	7	13	8.75	1.82

Jaundice was the second most common symptom in 75% (18 cases) of the patients. Other notable symptoms included nausea and vomiting, loss of appetite, fever, yellowish discoloration of urine, and itching. The most common clinical sign elicited in the patients in our study was tenderness over the right hypochondrium followed by icterus. In the USG of the abdomen, the CBD was dilated in all the patients in our study ranging between 12 mm and 23 mm, with a mean diameter of (16.33±2.96) mm (Table 1). The CBD was dilated in all patients who did MRCP, with a diameter ranging between 12 mm and 24 mm (Table 2). In our study, the duration of the surgeries was from 95 mins to 170 mins. The mean duration of operation was (108.54±17.41)mins (Table 5). The duration of surgery was higher in patients with adhesions and bleeding intraoperatively.

The postoperative hospital stays of the patients were from 7 to 13 days depending on the recovery, with a mean hospital stay of (8.75±1.82) days (Table 7). Most of the patients were discharged on the 7th to 9th postoperative day. The patients with immediate postoperative complications had higher postoperative hospital stays. All the patients were reviewed after one month and two months postoperatively. During the second month's visit, ultrasonography of the abdomen was done, and the status of the hepatobiliary system was reviewed. No patient had any evidence of retained stone, nor did they have any symptoms of cholangitis, features suggestive of the development of Sump syndrome, or any other follow-up postoperative complications.

DISCUSSION

Choledochoduodenostomy (CDD) was first performed in 1888 by Riedel and the first case led to unfortunate results.¹³ The first successful operation was performed in 1891 by Sprengel and ever since has been accepted as an easy and effective measure to drain the CBD.¹³ It still has its place in the management of choledocholithiasis despite the development of endoscopic procedures and the trends of minimally invasive approaches to this pathology. CDD is technically simple, fast to perform, effective, and safe alternative. The present study has similarities with the findings in other studies regarding postoperative complications (Table 8). However, wound infection and biliary leakage were comparatively less in this study, with no record of any intra-abdominal abscess or septicaemia in

any of the patients. In addition, no cases of mortality have been recorded.

Table 8: Post-operative complications in different studies.

Study	Postoperative complications	%
Gupta ²⁰	Wound infection	7
	Intra-abdominal abscess	26
Leppard et al ¹⁹	Wound infection	20
	Biliary leakage	13
Houssem et al ¹⁸	Wound infection	4
	Intra-abdominal abscess	2
Asad et al ¹⁷	Wound infection	10.6
	Biliary leakage	2.35
Parneet et al ¹⁶	Wound infection	12
	Biliary leakage	4
Present study	Wound infection	4.2
	Biliary leakage	4.2
	Abdominal distension	4.2
	Fever (physiological)	12

Hospital stays postoperatively in the present study have similarities with other studies by Parneet et al.¹⁶ The lesser number of post-operative days has been attributed to fewer post-operative complications and early mobilization during the stay. To prevent anastomotic stenosis, the anastomotic stoma should be sufficiently large or wide to ensure good biliary drainage. The large or wide CDD anastomosis may prevent complications such as reflux cholangitis and sump syndrome. Primary duct stones have been associated with biliary stasis as a major contributing factor.¹⁴ For treatment and alleviation of biliary stasis, the pathogenesis of the stone must be taken into consideration. Biliary relief by CDD might prevent stone formation when considered in the context of the current findings. The stone formation has also been linked to biliary infection as a crucial element. A large anastomosis via CDD may be essential for the prevention of biliary stasis to facilitate easier bile flow through the intestines. Biliary stasis will predispose to biliary infection easier.¹⁵ The study demonstrated that CDD was a simple, safe effective, and acceptable therapy for the treatment of patients with common bile duct stones, especially in cases of difficult endoscopic treatment, failed or recurrent stones. Long-term complications of this procedure, such as reflux cholangitis, stone recurrence, pancreatitis, and sump syndrome, were relatively uncommon and acceptable. This result was possibly due to the fewer number of cases with anastomosis stricture and recurrent stones during long-term follow-up.¹⁵

Limitations

This was a single-centered study with a small-sized sample population. Moreover, the study was conducted over a very short period with a short duration of follow-up. So, the findings of this study may not fully reflect the exact

scenario of the whole nation, and further multicentric studies with larger sample populations with long-term follow-up may be useful for a better understanding of the outcomes.

CONCLUSION

In the era of advanced endoscopy, surgical management of common bile duct stones still holds a vital role in selected cases, especially in areas with little access to advanced care. We presented our experience with surgical management of stones in the CBD for one year. There were minimal complications, such as wound infection, fever, and biliary leakage. Open side-to-side choledochoduodenostomy still has its place in the management of choledocholithiasis as it is simple, easy to perform, and significantly reduces the chances of retained stones in CBD if patients are appropriately selected. Choledochoduodenostomy can be performed with good long-term results if a wide enough anastomosis can be created; it reduces total cost and the need for repeat procedures. Open side-to-side choledochoduodenostomy should be considered a method of choice in remote areas where endoscopic facilities are lacking and in patients where cost is a factor in deciding the choice of procedure, with reduced postoperative complications like retained stones and a shorter duration of hospital stay in expert surgical hands. We recommend conducting similar studies in multiple centres with larger-sized sample populations for more understanding of the outcomes.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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