

SURGICAL MANAGEMENT OF COMMON BILE DUCT STONES WITH BILIOENTERIC ANASTAMOSIS A RELIABLE PROCEDURE TILL DATE- SINGLE CENTRE OBSERVATIONAL STUDY

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Received: 21-04-2024

Accepted: 02-05-2024

Published: 07-06-2024

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ABSTRACT

Background: In the era of Endoscopy, surgical management of common bile duct stones still promising in few patients with incomplete stone removal. The aim of this study was to assess the need and outcome of choledochoduodenostomy in group of patients for difficult CBD stones. **Materials and method:** This is a retrospective review of cases from a tertiary care centre in India from January 2019 to December 2022. **Results:** Out of total 38 patients of difficult CBD stones, 25 patients underwent Endoscopic retrograde cholangiography (ERC), stenting was done in the view of incomplete stone removal and in 13 patients without ERC, Laparoscopic CDD (choledochoduodenostomy) in 5 patients (13.1%), open CDD in 33 patients (86.84%). One patient underwent open CDD with splenectomy for AIHA with splenomegaly. The mean operating time 180.78 ± 21.21 mins. However, we had early complications which includes bile leak ($n=4$ 10.5%) three patients in Open CDD, one patient in Laparoscopic CDD, which was managed conservatively, wound infection ($n=9$ 23.6%) in biliary stented patients, hyperamylasemia ($n=1$ 2.63%) and intra-abdominal collection ($n=1$ 2.63%), was managed by percutaneous drainage. we have observed lesser early complications in Laparoscopic CDD compared to Open CDD. Complications in median follow up period of 13.5 months (3-24 months) were uneventful. **Conclusion:** Laparoscopic/Open CDD have been found to be reliable and efficient rescue procedure managing difficult CBD stone in patients with or without prior Endotherapy. Laparoscopic CDD in selective patients have better short term outcome.

KEYWORDS: Choledochoduodenostomy, cholecystectomy, Laparoscopy, Endoscopy retrograde cholangiography.

INTRODUCTION

Gall stone disease has been one of the most commonly diagnosed abdominal condition worldwide in recent times. Choledocholithiasis is the 2nd most common complication of gallbladder stone disease and its incidence increases with age. The incidence of common bile duct stones (CBDS) in patients with symptomatic cholelithiasis varies widely in the literature between 5% and 15% according to age.^{1,2}

Currently, the standard treatment for CBD stones is the laparoscopic cholecystectomy after extracting the stones completely via endoscopic retrograde cholangiopancreatography (ERCP), success of ERC stone retrieval in choledocholithiasis is 90%, still there is role of surgery in 10% patients for incomplete stone removal, there is need of CBD exploration with biliary enteric anastomosis in certain group of patients with difficult common bile duct stones (CBD). Patient labelled as difficult CBD stones based on European society of Gastrointestinal endoscopy (ESGE) guidelines 2019 with the imaging features of multiple impacted stones with dilated CBD >1.5 cm.

Biliary enteric anastomosis for choledocholithiasis offers effective procedure in selected group of patients compared to patients with multiple endoscopic intervention to clear the CBD stones.

Choledochoduodenostomy as surgical management of obstructive jaundice had been described long back by Riedel in 1888³, though done infrequently, this technique has been standardized and has yielded good results. It offers some advantages over choledochojejunostomy such as

- A more physiologic conduit
- Relatively quick and simple, with fewer anastomotic sites
- Ease of access for future endoscopic interventions.

AIMS AND OBJECTIVES

The aim of the study to assess the indication and outcome of choledochoduodenostomy in group of patients with choledocholithiasis with or without prior endotherapy.

Patients included in the study group are: Failed/ incomplete ERC stone retrieval, upfront choledochoduodenostomy in a case of dilated CBD > 1.5cm.

MATERIAL AND METHODS

It was a retrospective review of the database, from a tertiary care teaching institution from India, from January 2019 up to December 2022.

Inclusion Criteria:

- 1) Dilated CBD with multiple impacted stones with failed/incomplete stone clearance with stented CBD
- 2) Previous Laparoscopic /open cholecystectomy
- 3) Previous subtotal cholecystectomy

Exclusion Criteria:

- 1) Active duodenal ulcer / Duodenitis
- 2) Duodenal scarring and fibrosis
- 3) Previous gastroduodenal surgery.

Endoscopic management of CBD stones in the study period (n=240) out of which 38 patients found to have difficult CBD stones. Most of the patients were referrals from medical gastroenterology. The decision to add a drainage procedure to CBDE with CDD was based upon a number of factors viz. inflammatory strictures, history of cholangitis episodes, available duct diameter (usually >15mm) and the duodenum normal confirmed preoperatively by upper GI scopy.

Based on co-morbid conditions, presenting symptoms and blood investigations, MRCP was done for all the patients. MRCP used to assess post-ERCP complications, stone site (ampullary, distal CBD, mid CBD or common hepatic duct (CHD), and number of stones (single or multiple), CBD diameter per mm, operative data, postoperative variables including complications like wound infection, bile leak, Hyperamylasemia, intra-abdominal collection in both ERC biliary stented and non stented patients and follow-ups were examined for stricture and SUMP syndrome with clinical history, biochemical test and imaging. After patients had received a detailed explanation of the procedure and its potential risks and complications, informed consent was obtained. Direct CBD Exploration with CDD based on multiple impacted in CBD stones, Patients chosen for Laparoscopic CBD Exploration and CDD based on the good Pre-op performance status. All the surgeries were performed as an elective procedure.

OPERATIVE PROCEDURE⁴

Open CBD exploration

All the patients were operated under a combined general and epidural anaesthesia. The patient was placed in supine position and abdomen opened through a right subcostal (Kocher's) incision. After an initial inspection of the abdomen, Gall bladder dissected by fundus first approach then cystic artery and cystic duct were skeletonised, ligated and divided, if calots frozen reconstituting type of subtotal cholecystectomy done, the CBD was identified and its medial border and lateral border were defined. Kocherization of the duodenum was done. A vertical choledochotomy was made not less than 1.5 cm in length as close to the duodenal margin as possible. The stones were extracted through the choledochotomy and a IFT 10Fr catheter was passed both proximally into the right and left hepatic ducts and distally across the ampulla and flushed. We planned for a drainage procedure whenever the dilated CBD was >1.5 cm and our preference was a single layered, side to side choledochoduodenostomy, interrupted with vicryl 3-0. A 28F abdominal drain placed in the Morrison's pouch and abdomen was closed in layers.

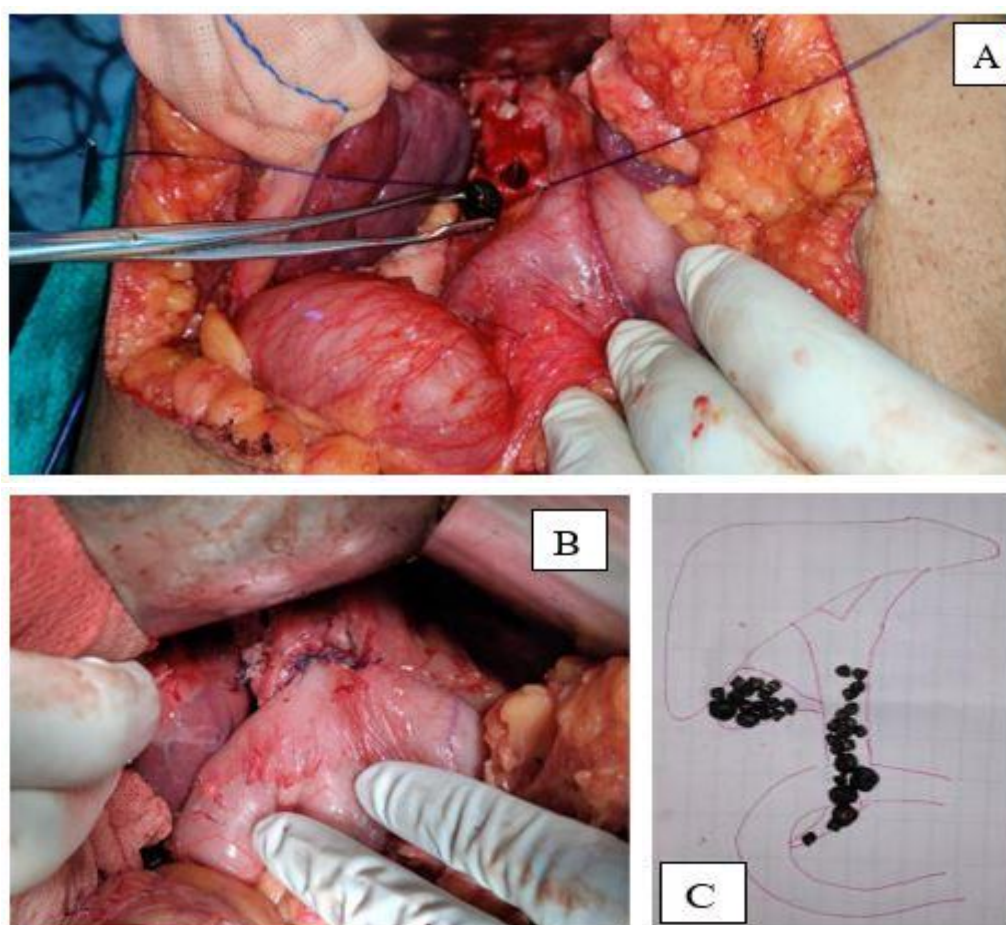


Figure 3: A- choledochotomy with CBD stones, B- CDD, C- diagrammatic representation of cholelithiasis, choledocholithiasis

LAP CDD

Patients underwent laparoscopic choledochoduodenostomy using a standard four-port technique with carbon dioxide pneumoperitoneum at 14 mm Hg pressure, using Veress needle. A 10-mm trocar was inserted in the umbilicus. Another 10-mm trocar was placed in the sub-xiphisternum. Two 5-mm trocars were put in the right upper quadrant 2 cm below the costal margin along the anterior axillary and mid-clavicular lines, respectively.

A 30° angled video-laparoscopy was used and placed through the umbilical port. Diagnostic laparoscopy was performed followed by the meticulous release of adhesions with blunt and sharp dissection, which was continued until the duodenum and the portal triad were defined. After delineating Calot's anatomy, the cystic artery is clipped and cut. Cystic duct is clipped towards gall bladder (GB). GB should be left intact attached to the hepatic bed during the entire procedure as this helps in upward traction, exposing entire infra-hepatic area. The CBD is incised longitudinally with monopolar hook beginning at the point where it transverses the duodenum posteriorly and extending proximally about 2.5 cm. Stone extraction is performed primarily by milking and further aided by saline irrigation using infant feeding tube. At this point, the previously placed stent, if any was removed. Both proximal and distal ducts are thoroughly rinsed with normal saline for clearing debris and stones. The duodenum is incised longitudinally along its superior border for a distance of approximately 1.5 cm. A single-layer anastomosis is performed using 3-0 Vicryl interrupted sutures. After completion of the anastomosis, the gallbladder is removed from the liver bed and specimen removed. A closed drain is placed in the lateral position to the anastomosis, headed toward Morrison's space. Fascia and skin are approximated.

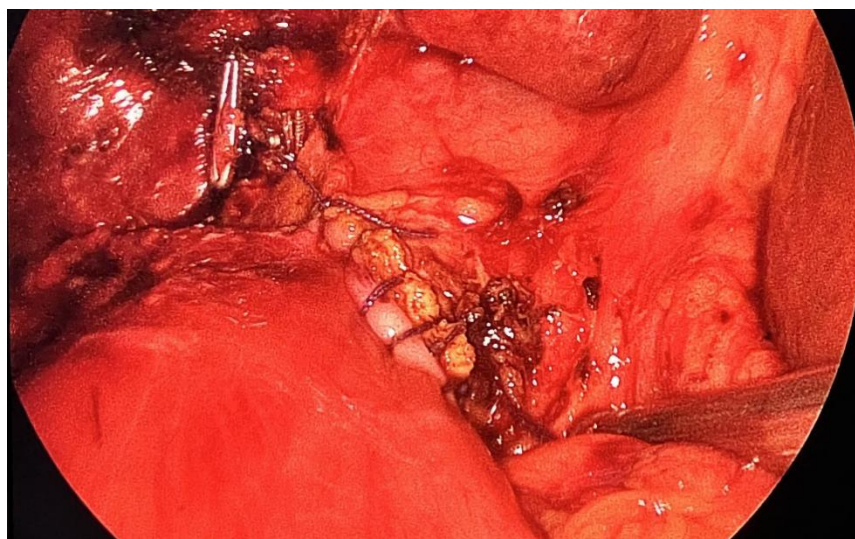
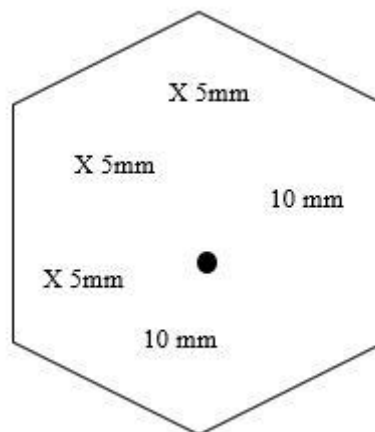


Figure 4: LAP CDD-Image showing clipped cystic duct and Choledochoduodenostomy



Figure 5: 11 years Retained CBD stent

TABLES:

Table 1: Demographic and operative variables (N=38)

(SD: standard deviation, ASA: American Anesthesiology Association, CBD: common bile duct, ERC endoscopic retrograde cholangiography, CDD: choledochoduodenostomy)

Sl. No.	VARIABLE	VALUE (mean± SD)
	Age	50.68±4.24
	Sex (M:F)	21:17
	ASA score (median)	2
	Comorbid conditions	14 (36.8%)
	CBD diameter (CM)	1.70±0.35
	Operative time (Mins)	180.78±21.21
	Blood loss (ML)	165.78±106.06
	Prior abdominal surgeries	3 (7.89%)
	ERC biliary stenting	25 (65.78%)
	Retained biliary stent	2 (5.2%)
	Reconstituting subtotal cholecystectomy	7 (18.42%)
	LAP CDD	5 (13.1%)
	Open CDD	33 (86.84%)
	Other procedures (splenectomy 1)	1 (2.63%)
	Complications	
	ound infection	9 (23.6%)
	ile leak	4 (10.5%)
	yperamylase mia	1 (2.63%)
	tra-abdominal collection	1 (2.63%)

Table 2: clinical presentation and predictors of biliary stones

(CBD: common bile duct, MRCP: magnetic resonance cholangio-pancreatography)

Variable	Number (percentage)
Clinical presentation	
Abdominal pain	36 (94.7%)
Obstructive Jaundice	13(34.2%)
Cholangitis	9 (23.6%)
Pancreatitis	2 (5.2%)

Predictors of biliary stones	
Bilirubin >4 mg/dl	13 (34.2%)
Cholangitis	9 (23.6%)
Gall stone pancreatitis	9 (23.6%)
Dilated CBD on MRCP	38 (100%)

Table:3 Upfront CDD (N:13)

Sl. No.	Variables	Number (percentage)
	Operative time	177.69 min
	Blood loss	134.6 ml
	Wound infection	Nil
	Bile leak	Nil
	Intra-abdominal infection	1

Table:4 CDD after biliary stenting (N:25)

Sl. No.	Variables	Number (percentage)
	Operative time	183.6 min
	Blood loss	186 ml
	Wound infection	9(36%)
	Bile leak	4(16%)
	Intra-abdominal infection	Nil

RESULTS

During the study period, 38 patients (M:F, 21:17, mean age 50.68 years) diagnosed with complicated CBD stones with variable presentation (Abd pain n=36 (94.7%), Obstructive Jaundice n=12 (31.5%), cholangitis n=9 (23.6%), Pancreatitis n=2 (5.2%) underwent choledochoduodenostomy.

Comorbidities in study population are, type2 DM (n=5), HTN (n=2), Autoimmune hemolytic anemia(n=1), hypothyroid (n=1), seizure disorder (n=1), Bronchial Asthma(n=1). Two patients had Retained biliary stent post ERC biliary stenting done in 2012(11 years back). In terms of the American Society of Anesthesiologists (ASA)grading, mean ASA II.

25 patients underwent Endoscopic retrograde cholangiography (ERC) prior to surgery, stenting was done with incomplete stone removal in difficult CBD stones.

13 patients without ERC of which 3 patients had duodenal diverticula for which ERC unattempted . Upfront CDD in three patients who had undergone biliary intervention, open cholecystectomy CBD Exploration,T-tube (n=1), LAP subtotal cholecystectomy (n=1), LAP cholecystectomy (n=1) .

Average dilated common bile duct in the study was 1.70 ± 0.35 . Reconstituting subtotal cholecystectomy with CDD for frozen calot's in 7(18.42%), LAP CDD in 5 (13.1%), open CDD in 33 (86.84%).

One patient underwent open CDD with splenectomy for AIHA with splenomegaly. The mean operating time was 180.78 ± 21.21 mins.

Immediate post operative complication, superficial wound infection n=9 (36%) in biliary stented patient, Bile leak n=4 (16%) of which three in open CDD and one LAP CDD, which resolved with conservative management, one patient developed post operative hyperamylasemia, one patient developed intra-abdominal collection managed with PCD. The drain tube was usually removed after POD5 delayed in bile leak and intra-abdominal collection.

DISCUSSION

Choledochoduodenostomy (CDD) has been reported by several studies as an effective treatment modality of common bile duct stones. *Riedel*, in 1888 performed the first Choledochoduodenostomy by side-to-side anastomosis which allowed equalization of intra-luminal pressure between the biliary tree and intestinal tract⁵. *Sprengel* in 1891, reported recovery in a female patient who had undergone choledochoduodenostomy⁶. *WJ Mayo* in 1905⁷ reported successful treatment of stricture of common bile duct by cholecystectomy and choledochotomy. *Sanders R. L.* reported that choledochoduodenostomy, was feasible, as a means of relieving obstructions of the common duct. The procedure is not only comparatively simple from the standpoint of technique, but is physiologic in principle and, thus, offers a wide margin of safety. All the bile is immediately made available in that portion of the intestinal tract where it normally empties, intestinal function is soon restored, and the patient's convalescence is thereby facilitated⁸. Chance of recurrent stones can be reduced by draining the common bile duct after stone clearance. CDD has been found to be easy, highly effective and definitive method of decompression, especially when posed with multiple stones in a dilated CBD. Other advantages of CDD include wide margin of safety because of its physiologic nature, earlier restoration of intestinal function, amenable to subsequent surgical intervention and facilitation of patient's convalescence. It can be performed in all age groups with and has a low morbidity and mortality specially when a wide side to side anastomosis is done.⁹⁻¹¹

The diameter of the duct and the length of the duct above the obstruction have been identified as important criteria for successful CDD. Many difficulties have been encountered in the past with side-tracking operations for obstruction of the bile ducts. Abdominal adhesions, hemorrhage and identification of the ducts and vessels often contribute to the time taken during the operation. Patients with long history of ductal obstruction also present with a deep jaundice and an alteration in the blood clotting time, advanced renal and hepatic changes which can further complicate the surgical procedure.

CDD has been recommended in treating multiple calculi of CBD, retained or residual stones, hepatic stones, distal CBD benign stricture, primary duct stone, dilated CBD failure of ERCP, or non-availability of ERCP.¹²⁻¹⁴

Several complications like wound infection, bile leak, hyperamylasemia, abdominal collection and specific complications like ascending cholangitis, alkaline reflux gastritis, and sump syndrome, have been described, which may be the reason of this procedure being performed less frequently over the years. However, there has been a renewed interest in CDD in the last three decades, with several publications carefully evaluating the results, indications, advantages, complications, and shortcomings of CDD. CDD has been considered a very satisfactory surgical procedure to treat a variety of obstructing lesions of the distal CBD.

This study aimed at assessing short term and long term outcomes following CDD in both biliary stented and non-stented patient groups. Studies have proven reflux of duodenal contents into biliary tree by radiological and endoscopic methods. Still, strong evidence is missing in the form of increased rates of cholangitis in patients undergoing CDD¹⁵. In our study, we did not encounter late complications like SUMP syndrome or strictures over a median follow up period of 13.5 months (3-24 months). However, we had early complications like bile leak in 4 patients (10.5%) which was managed conservatively. Other complications like wound infection in 9 patients (23.6%) in biliary stented patients, hyperamylasemia in 1 patient (2.63%) and intra-abdominal collection in 1 patient (2.63%), was managed by percutaneous drainage.

In a study of 125 cases by H Okomoto et al. reflux cholangitis and stone recurrence was 1.6% (2/125) and 0% (0/125) of cases by CDD. There is no therapeutic related pancreatitis in CDD. Sump syndrome was also not observed in side-to-side CDD.¹⁶

An extensive literature review showed that the absence of this complication could be explained based on at least two important factors. Firstly, a wide tension-free anastomosis provides effective drainage of enteric contents that may enter the CBD through the CDD site. Secondly, the narrow part of CBD distal to the anastomosis prevents the entry and stasis of duodenal contents. Also, in patients who have undergone a preoperative ERCP with papillotomy, the contents easily pass through the ampulla, preventing this complication altogether¹⁷.

CONCLUSION

LAP/OPEN CDD have been found to be reliable and efficient rescue procedure managing complicated CBD stone in patients with or without prior Endotherapy. LAP CDD in selective patients have better short term outcome.

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