

Long-term results of choledochoduodenostomy in benign biliary obstruction

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Abstract

AIM: To determine the long-term results of choledochoduodenostomy in patients with benign biliary obstruction.

METHODS: This prospective study was conducted at Sheri Kashmir Institute of Medical Sciences Srinagar Kashmir, India over a period of 10 years from January 1997 to December 2007. The total number of patients who underwent choledochoduodenostomy during this period was 270. On the basis of etiology of biliary tract obstruction, patients were divided into a calculus group, an oriental cholangiohepatitis group, a benign biliary stricture group and others. Patients were followed for a variable period of 13 mo to 15 years.

RESULTS: Choledochoduodenostomy (CDD) with duodenotomy was performed in four patients. CDD with removal of T- tube, CDD with left hepatic lobectomy and CDD with removal of intra biliary ruptured hydatid was performed in three patients each. In the remain-

ing patients only CDD was performed. Immediate post operative complications were seen in 63 (23%) patients, while long-term complications were seen in 28 (11%) patients, which were statistically significant. Three patients died during hospitalization while four patients died in the late post-operative period.

CONCLUSION: Our conclusion is that CDD is safe and produces good long term results when a permanent biliary drainage procedure is required.

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Key words: Choledochoduodenostomy; Oriental cholangiohepatitis; Biliary calculi; Cholangitis

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INTRODUCTION

Choledochoduodenostomy (CDD) has been the subject of considerable controversy since its first description by Riedel in 1892. Its acceptance is still debated in view of the expected complications, such as ascending cholangitis, sump syndrome and alkaline reflux gastritis. In spite of the good long-term results observed in some studies, CDD is considered a last resort for lower common bile duct (CBD) obstruction. The common indications for CDD have remained unchanged over the years and also have dominated our series. These are choledocholithiasis, lower bile duct strictures, worm obstruction, papillary or

ampullary stenosis, perivaterian diverticuli. In the modern era of endoscopy a significant number of patients still need surgical intervention for benign biliary duct obstruction but as repeated interventions on the CBD lead to increased morbidity and mortality, a permanent drainage procedure is indicated in all such patients. The present study was conducted to evaluate the effectiveness of CDD in preventing the need for repeated exploration and the occurrence of long-term complications.

MATERIALS AND METHODS

The prospective study was conducted at Sheri Kashmir Institute of Medical Sciences Srinagar Kashmir, India over a period of 10 years from January 1997 to December 2006, upon patients who underwent choledochoduodenostomy. The study comprised 270 patients (99 males and 171 females) of 20 to 70 years of age. Forty two patients were lost to follow up. The remaining 232 patients formed the database of this analysis.

All patients were subjected to baseline investigations which included haemogram kidney function tests, liver function tests and coagulogram. Abdominal sonography and endoscopic retrograde cholangiopancreatography (ERCP) were the most common investigation tools. Computerised tomography and magnetic resonance cholangiopancreatography were used when indicated. On the basis of pre-operative diagnosis and intra-operative findings, patients were divided into four groups (Table 1). These were the Calculus group where ERCP had failed to clear the common bile duct of stones, the Oriental cholangiohepatitis group (separately categorized because of different course of the disease process), the benign biliary Stricture group and the others (including cases of biliary ascariasis, intra-biliary rupture of hydatid liver, chronic pancreatitis, and portal hypertension with CBD stone.

Statistical analysis

Chi square test was used for statistical evaluation.

Technique of lateral choledochoduodenostomy

Side-to-side choledochoduodenostomy is the procedure of choice for all indications except iatrogenic injuries and the controversial indication of malignant obstruction. Complete circumferential division of the common bile duct or the common hepatic duct compromises the blood supply to both ends of the duct and may predispose the anastomosis to an ischemic stricture. After the cholecystectomy is carried out, the duodenum and pancreas are mobilized by an extensive Kocher manoeuvre. The common bile duct is exposed by incising the overlying peritoneum. The common bile duct is opened longitudinally with a scalpel at the supraduodenal location, extending proximally for 2 to 2.5 cm. Any manipulations such as removal of any stone, worms or biopsy are completed at this point. After common bile duct exploration and proper mobilization and exposure

Table 1 Final diagnosis in patients¹ (n = 270)

No.	Presentation	Male		Female		Total	
		n	%age	n	%age	n	%age
1	Calculus group	41	15.18	92	34.07	133	49.26
2	OCH group	39	14.44	42	15.55	81	30.00
3	B.B. Strictures/ligatures ²	9	03.33	17	06.29	26	09.63
4	Others	10	03.70	20	07.40	30	11.11
Total		99	36.66	171	63.33	270	100

¹More findings than one were present in many cases; ²This group also includes cases of ampullary stenosis.

have been achieved, a longitudinal incision is made in the post bulbar duodenum using cautery for a distance of approximately 1.5 cm. A single layer anastomosis using 3-0 Vicryl is accomplished by beginning posteriorly and positioning the knots on the outside of the anastomosis. The anterior portion of anastomosis is performed using simple interrupted sutures. A closed suction drain is placed in the area of anastomosis but not in direct contact with it. The drain is removed on the fourth post-operative day.

Follow up

The patients were followed up 6 weekly for first three months, quarterly for the following nine months, biannually for the next two years and annually thereafter.

Follow up was for an average period of 8.25 years (ranging from 13 mo to 13 years). During follow up visits investigations were guided by comprehensive history and clinical examination including liver function test, abdominal sonography, gastroduodenoscopy and biliary scintigraphy. Deworming of the patients was a final and important component of our follow up. The final outcome of the patients was recorded and systematically arranged for evaluation.

RESULTS

In our study of 270 patients there was not much difference in the mean ages of the patients of the two sexes: 47.12 ± 12.61 in males, 44.92 ± 13.83 in females ($P > 0.05$).

Among the clinical features, pain was the most consistent symptom in all cases (100%) followed by fever/rigors (50%), vomiting (43%), jaundice (33%). At the time of presentation 53.33% of the patients had serum bilirubin less than 1.3 mg%, and only 11.8% of the patients had levels above 10 mg%. Serum alkaline phosphatase was raised in 92.22% of the patients, and was normal in only 7.78%.

The size of CBD varied from 2 to 3 cm in our series. CDD with duodenotomy was required in 4 patients for impacted stones at the lower end of CBD. CDD with removal of T-tube, CDD with (L) Hepatic Lobectomy and CDD with Removal of intra-biliary ruptured hydatid was performed in three patients each. Redo-CDD was carried out in two patients, one each from oriental cholangiohepatitis (OCH) and Calculus groups, who had

Table 2 Post-operative complications in cases (*n* = 270) (%)

Complications	Calculus group	OCH group	Stricture group	Others group	Total	<i>P</i> value
Wound						
Infection	9 (6.76)	6 (7.4)	1 (3.84)	1 (3.33)	17 (6.2)	> 0.05
Dehiscence	-	-	-	1 (3.33)	1 (0.3)	> 0.05
Hernia	1 (0.7)	-	-	-	-	> 0.05
Post-op. fever	5 (3)	10 (12)	1 (3)	1 (3)	17 (6)	> 0.05
Septicaemia	-	4 (5)	1 (3)	2 (6)	7 (3)	> 0.05
Pulmonary						
Atelectasia	6 (4)	3 (3)	2 (7)	1 (3)	12 (4)	> 0.05
Pneumonia	1 (0.75)	2 (2)	-	-	3 (1)	> 0.05
Peritoneal						
Haemorrhage	-	-	-	-	-	
Bile drainage	1 (0.75)	2 (2)	1 (3)	-	4 (2)	> 0.05
Cardiovascular	-	-	-	-	-	
MI	-	-	-	-	-	
Arrhythmia	-	2 (2)	-	-	2 (0.74)	> 0.05
Total					63 (23.3)	NS

P value > 0.05 (non-significant). NS: Non-significant; OCH: Oriental cholangiohepatitis; MI: Myocardial infarction.

undergone CDD three and seven years earlier, respectively. Redo-CDD was performed in these patients, instead of CBD exploration only, because of the presence of distal stricture. The operative technique in redo-CDD was same as was used in other patients. All patients with OCH had undergone unsuccessful endoscopic treatment before surgery.

As shown in Table 2, 63 patients (23.33%) across all four groups developed immediate post-operative complications. This was statistically insignificant (*P* > 0.05). Long-term complications were seen in 28 (11%) patients (Table 3). No case of sump syndrome, recurrent/residual calculi or biliary ascariasis was recorded. On long-term follow up patients were classified on the basis of symptomatology and investigations of the four groups can be seen in Table 4.

As shown in Table 5, 3 patients died during their hospitalization, due to septicaemia and its complications in all cases. Four patients died in the late post-operative period, including 3 patients from the OCH group who had developed liver abscess on long-term follow up and died of the same. Thus the overall mortality was 2.59%.

DISCUSSION

The historical development of choledochoduodenostomy was summarized by Madden and associates in 1970. The review of the relevant literature and the observations of the present study suggest that the indications for CDD remain very much the same as those detailed by Degenshein^[1] in 1974 (except for the malignant ones). CDD has been recommended in the treatment of multiple calculi of the common bile duct, retained or residual stones, hepatic stones, distal common bile duct strictures, ampullary stenosis, benign ampullary tumours^[1], primary duct stones, recurrent common duct stones, dilated CBD with diameter greater than 20 mm, failure of ERCP, non-availability of ERCP^[2-6]. While CDD is

Table 3 Incidence of long-term complications (*n* = 225) (%)

Complications	Calculus group <i>n</i> = 106	OCH group <i>n</i> = 81	Stricture group <i>n</i> = 22	Others group <i>n</i> = 16	Total	<i>P</i> value
Alkaline gastritis	6 (5.67)	4 (5.4)	1 (4.5)	-	11 (4.88)	> 0.05
Cholangitis	-	5 (6.8)	1 (4.5)	1 (3.84)	7 (3)	> 0.05
Liver abscess	-	3 (3.7)	-	-	3 (1)	> 0.05
Stenosis of anastomosis	1 (0.96)	-	1 (4.5)	-	2 (0.8)	> 0.05

P value > 0.05 (non-significant). OCH: Oriental cholangiohepatitis.

particularly recommended for use in elderly patients^[7], it is also recommended in younger patients since a more aggressive therapy may be indicated in their often “more aggressive lithogenic diathesis”^[8]. Choledocholithiasis (primary/secondary, retained/residual, recurrent or impacted) remains the sole indication in our series (49.26%) and none of the patients developed recurrent or residual stones, making CDD highly recommendable for such patients. There are some patients where CDD is contraindicated. These include patients with CBD less than 15 mm in diameter, perivaterian diverticulum and sclerosing cholangitis.

OCH was the next most common indication for CDD in our series (30%, i.e., 81 patients). This was expected as our Institute is in a high prevalence zone of the disease. This poses a challenge to the surgeons to treat these cases effectively. We subjected 3 patients to CDD with left hepatic lobectomy for hepatolithiasis and atrophied lobe. In the remaining 78 patients CDD was performed after the stones and debris had been removed. Of these patients 10% developed solitary/multiple liver abscesses, probably by the development of new proximal strictures/stones making the draining anastomosis less efficient. Recently, Tang *et al.*^[9] used laproscopic choledochoduodenostomy (LCD) as an effective drainage procedure in 12 patients with recurrent pyogenic cholangitis. There was no recurrence of cholangitis or any evidence of sump syndrome in these patients.

The principal aim of this study was to analyze the results obtained with CDD in patients followed for 1-13 years and to determine the safety of this operation even at the extremes of age. We experienced 3 (1.11%) early post-operative deaths due to suppurative cholangitis or biliary peritonitis. There were 4 (1.77%) late deaths (between 8 mo to 10 years) during the long-term follow up. Although a mortality rate of less than 1% has been reported for CDD⁷, the average mortality rate is 2%-5% and can be much higher^[1,2,4,10]. The morbidity of CDD observed in our study (23.33%) as well as the type of observed complications, parallels those previously reported in the literature. Perhaps the most important aspect of our study is absence of sump syndrome and interestingly, biliary ascariasis. Sump syndrome is a rare and late complication of side-to-side CDD. Its prevalence has long remained uncertain and has been reported to vary between 0% and 9.6%^[4,8,11]. Based on our observations, three factors could explain the absence of this complication in our series in spite of side-to-side anastomosis being

Table 4 Clinical classification of the patients (*n* = 225)

Results	Patient complaint	Ultrasonography	Liver function test	EGD	HIDA scan	Total
Excellent	None	Normal	Normal	-	-	116 (51.55%)
Good	Occasionally dyspeptic	Normal	Normal	+/-	-	93 (41.33%)
Moderate	Evident dyspepsia, nausea, bilious vomiting or fever rigours	Normal or IHD dilated	Normal or slightly deranged	Alkaline gastritis	Patent anastomosis evidence of gastric reflux	11 (4.88%)
Bad	Septecemia/cholangitis, anastomotic stenosis	Liver abscesses	Grossly deranged	+/-	Patent anastomosis, dilated IHD with slow transit	5 (2.22%)

EGD: Esophagogastrroduodenoscopy; IHD: Intra-hepatic duct.

Table 5 Demographics, diagnosis and cause of death of 7 patients who died after choledochoduodenostomy

No.	Age (yr)	Sex	Time	Initial daignosis	Cause of death
1	55	M	1st POD	Suppurative cholangitis	Septic shock/DIC
2	32	F	2nd POD	Biliary peritonitis	Septicaemia with arrhythmia
3	65	M	12th POD	Infected liver hydatid with intra-biliary rupture	Wound dehiscence with septicaemia with ARDS
4	54	M	8 mo	OCH with right lobe liver abscess with cholangitis	Septicaemia with MODS
5	46	F	13 mo	OCH with multiple liver abscess	Septicaemia with MODS
6	58	F	15 mo	Suppurative cholangitis	Arrhythmia
7	45	M	10 yr	OCH with multiple liver abscess with sepsis	Septicaemia with MODS

OCH: Oriental cholangiohepatitis; MODS: Multiple organ dysfunction syndrome; DIC: Disseminated intravascular coagulation; ARDS: Acute respiratory distress syndrome.

used in all the cases. First, a sump with wide anastomosis provides effective drainage of food debris that enters the bile duct. Second, the lower aspect (sump) of the anastomosis is usually narrow and this prevents the entry and impaction of food debris in the sump segment. A third important factor was the pre-operative ERCP which was carried out in 89.25% of patients in which wide papillectomy was made in most cases, thereby arresting this complication before it occurred.

Our study was conducted in a zone of high endemic ascariasis in which the surgeons created a biliary-enteric anastomosis with an inherent risk of worm migration into the biliary radicals. To contain this risk the patients were advised to take regular antihelminthic drugs at intervals of 3-4 mo to keep their intestinal worm load to the minimum. Interestingly, even those patients who did not comply with this regime did not show any increased incidence of biliary ascariasis. This was probably because a wide gateway created allows the worms to pass easily in either direction without getting stuck, thus avoiding the pathogenesis of biliary ascariasis and its complications. However, further studies are needed to confirm this. On long-term follow up we observed alkaline reflux

gastritis in 4.88% of the patients. These patients were treated effectively by ursodeoxycholic acid (dose 300 mg BD for 10-14 d). Mihmanli *et al.*^[12] noticed a higher incidence of alkaline reflux gastritis in their series (20.8%). In our series of 225 patients the incidence of cholangitis observed was low, at 3.11%, (7 patients of whom 5 were from the OCH group), possibly explained by the progressive nature of the disease in the proximal hepatobiliary segments. Escudero-Fabre *et al.*^[13] reported proved cholangitis in 4.2% of cases. In the clinical classification of the patients, according to the results from the long-term analysis, the “Good” and “Excellent” were predominant, with 93 patients (41.33%) in the former group and 69 patients (30.66%) in the latter. The “Moderate” group of 48 patients (21.33%) included patients with evident dyspepsia, nausea, bilious vomiting (alkaline gastritis) or fever and rigors (cholangitis). We had 15 patients (6.66%) in the “Bad” category, all of whom had cholangitis/septicemia and liver abscess(es) and most of whom were from the OCH group. Mihmanli *et al.*^[12] observed 75% of CDD patients in excellent or good category and the remaining 25% in moderate category. Bhandarkar *et al.*^[14] observed that LCD is a safe and effective option in patients with stones in a dilated bile duct when endoscopic clearance has failed. Tang *et al.*^[9] selected twelve patients with diagnosis of recurrent pyogenic cholangitis with the absence of intrahepatic stricture for laparoscopic choledochoduodenostomy during the period from 1995 to 2002. The majority of patients had repeated attacks of cholangitis and had already undergone multiple sessions of endoscopic and operative lithotripsy. The laparoscopic choledochoduodenostomy was performed using a five-port approach with the patient lying in the supine position. The stones were first cleared through the longitudinal supraduodenal choledochotomy followed by construction of a side-to-side diamond-shaped anastomosis of at least 15 mm between the bile duct and the first part of the duodenum using 2/0 monocryl in the single-layer method. The median operation time was 137.5 min (90-270) and the median postoperative stay was 7.5 d (5-20 d). Average analgesic requirement post operation was 126 mg (50-200 mg) intramuscular pethidine. There was one postoperative bile leak, and this complication was resolved by conservative measures. Upon a mean follow up of 37.6 mo (6-91 mo), there was no recurrent attack of cholangitis or any evidence of

sump syndrome in this group of patients. The authors concluded that laparoscopic choledochoduodenostomy is a safe and effective drainage procedure for patients with RPC. Complications are uncommon and postoperative results are promising.

In conclusion, a number of inferences can be drawn from the observations made in this study. CDD produces, both in elderly high risk patients and in younger ones with a longer life expectancy, good long term results in the treatment of benign biliary tract obstruction when a permanent biliary drainage procedure is required. However, the size of the CBD is of critical importance and should be at least 15 mm in diameter. Meticulous and precise suturing techniques are also essential. If these precautions are observed, cholangitis and symptoms related to sump syndrome are absent or occur very infrequently. While CDD is not the ideal procedure for OCH patients who rather need a multidisciplinary approach, it is the operation of choice in benign biliary tract obstruction.

COMMENTS

Background

Choledochoduodenostomy (CDD) has been performed for a variety of diseases of the biliary tract and pancreas.

Research frontiers

CDD has been recommended in the treatment of multiple calculi of the common bile duct (CBD), retained or residual stones, hepatic stones, distal common bile duct strictures, ampullary stenosis, benign ampullary tumours: primary duct stones, recurrent common duct stones, dilated CBD with diameter more than 20 mm, failure of endoscopic retrograde cholangiopancreatography (ERCP), non-availability of ERCP. The principal aim of this study was to analyze the results obtained with CDD and to determine the safety of this operation even in the extremes of age.

Innovations and breakthroughs

While CDD is recommended as a treatment modality in elderly patients, it is also recommended in younger patients since a more aggressive therapy may be indicated in their often more aggressive lithogenic diathesis.

Applications

Although, sometimes replaced by endoscopic papillotomy or sphincterotomy, there remain situations where surgical therapy is required.

Peer review

The authors have conducted the present study to evaluate the effectiveness

of CDD in preventing the repeated exploration and occurrence of long-term complications in patients with common bile duct obstruction. The results are interesting and may form the basis of further study.

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