

# Choledochoduodenostomy: Is It Really So Bad?

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## Abstract

**Background** Choledochoduodenostomy (CDD) has been shunned by some surgeons for the management of the benign distal common bile duct stricture due to the potential complication of “sump syndrome.” The feared sump syndrome is theorized to occur from bile stasis and reflux of duodenal contents into the terminal common bile duct with bacterial overgrowth, resulting in cholangitis or hepatic abscess. The true incidence and resultant morbidity of sump syndrome, however, are not well defined.

**Methods** With the approval of the Institutional Review Board, a retrospective chart review of all patients undergoing choledochoduodenostomy for benign disease at a single institution between 1994 and 2008 was undertaken. Data were collected with particular attention to operative indications, perioperative course, and long-term results. Long-term outcomes were assessed through clinical reports at outpatient follow-up, emergency room visits, and hospital readmissions.

**Results** Seventy-nine patients underwent side-to-side CDD for benign diseases over the 15-year period [51 (65%) men; mean age, 52 years (standard deviation (SD), 12)]. Indications for surgery included chronic pancreatitis (80%), choledocholithiasis (11%), and cholangitis (4%). Patients presented with abdominal pain (80%), nausea/vomiting (30%), and jaundice 13%. Sixty-one patients (77%) underwent an additional procedure at the time of their CDD, including lateral pancreaticojejunostomy (26%). There was no perioperative mortality. Postoperative complications occurred in 15 (19%) patients, including intraabdominal abscess (26%), wound infection (20%), and biliary leakage (13%). The mean hospital stay was 9.7 days (SD, 6.9). The mean follow-up was 6.2 years (SD, 4.2). There was no occurrence of cholangitis. Two patients (2.5%) developed hepatic abscess, which was managed by antibiotics and image-guided percutaneous drainage.

**Conclusions** CDD is a safe and effective method of decompressing the distal common bile duct in benign pancreatobiliary disease. Long-term results are acceptable, with sump syndrome being a rare occurrence.

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## Introduction

In a room dimly lit by overhanging gas lanterns, with the fresh smell of sawdust lying around the operating table, the surgical amphitheater was crowded with enthusiastic students and colleagues as Bernhard Riedel began his operation. The patient was a middle-aged woman who had survived a cholecystectomy on July 23, 1888. The patient was still jaundiced in December of that year, and Riedel was concerned that a residual stone was retained in the bile duct. Riedel removed several stones and carried out a side-to-side anastomosis between the bile duct and duodenum. The enthusiasm surrounding this operation, the first

choledochoduodenostomy, was short lived. The patient died 9 h later. At the autopsy, an anastomotic leakage was found.<sup>1</sup>

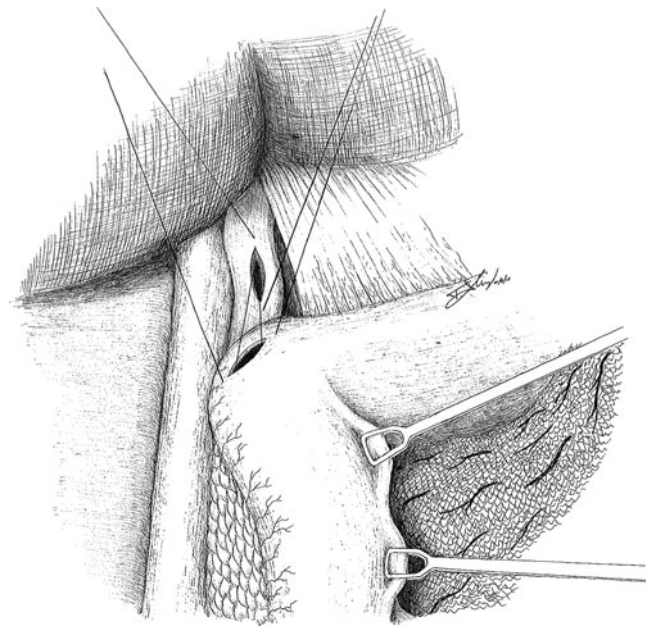
Choledochoduodenostomy (CDD) has been described in the literature since the nineteenth century. CDD is undertaken for many indications, including failure of clearance of distal common bile duct stones during common duct exploration, multiple large or primary common bile duct stones, benign biliary stricture, and malignant neoplasms.<sup>2,3</sup> CDD has been shunned, however, by some surgeons for the management of benign distal common bile duct strictures due to the potential complication of “sump syndrome.” The feared sump syndrome is theorized to occur from bile stasis and reflux of duodenal contents into the terminal common bile duct with bacterial overgrowth, resulting in cholangitis or hepatic abscess. Many favor a choledochojejunostomy, utilizing a Roux-en-Y limb, to avoid this pathophysiology. The true incidence and resultant morbidity of sump syndrome, however, are not well defined and has not been well examined in the modern era.

## Methods

With the approval of the Institutional Review Board, a retrospective chart review of all patients undergoing choledochoduodenostomy for benign disease at the Medical University of South Carolina between 1994 and 2008 was undertaken. Two surgeons performed all cases in the designated time period. The surgical technique employed was a side-to-side CDD with longitudinal incisions on the distal common bile duct and duodenum. A key portion of the surgery is maximal possible duodenal mobilization with a generous Kocher maneuver. Longitudinal incisions with a straightforward side-to-side interrupted anastomosis so the duodenum is least distorted. The anastomosis is a single layer with fine absorbable monofilament suture and approximately 2 cm (Fig. 1). Data were collected with particular attention to the operative indications and perioperative course, including symptoms, complications, hospital length of stay, and mortality. Long-term outcomes were assessed through clinical reports at outpatient follow-up, emergency room visits, and hospital readmissions.

## Results

Seventy-nine patients underwent side-to-side CDD for benign diseases over the 15-year period [51 (65%) men; mean age, 52 years (standard deviation (SD), 12)]. Indications for surgery included chronic pancreatitis (80%), choledocholithiasis (11%), and cholangitis (4%; Table 1). Patients presented with abdominal pain (80%),



**Fig. 1** A generous Kocher maneuver allows for maximal possible duodenal mobilization, where longitudinal incisions are performed with a side-to-side interrupted anastomosis. The anastomosis is a single layer with fine absorbable monofilament suture, at least 2 cm in length

nausea/vomiting (30%), and jaundice (13%; Table 2). Sixty-one patients (77%) underwent an additional procedure at the time of their CDD, most commonly lateral pancreaticojejunostomy (26%). There was no perioperative mortality. Postoperative complications occurred in 15 (19%) patients, including intraabdominal abscess (26%), wound infection (20%), and biliary leakage (13%) (Table 3). The mean hospital stay was 9.7 days (SD, 6.9). The mean follow-up was 6.2 years (SD, 4.2). There was no occurrence of cholangitis. Two patients (2.5%) developed hepatic abscess.

The first patient to develop a hepatic abscess underwent a CDD secondary to debilitating pain from chronic pancreatitis with distal biliary stricture and pancreatolithiasis. In addition to CDD, the patient underwent a lateral pancreaticojejunostomy, cholecystectomy, and feeding tube jejunostomy at the time of the CDD. The patient did not have any apparent postoperative complications. Just over 1 year after surgery, the patient presented to an outside hospital complaining of abdominal pain. A computed tomography scan (CT) revealed a right hepatic lobe abscess, which was successfully percutaneously drained in interventional radiology. Two weeks later, a follow-up CT showed a continued abscess. An endoscopic retrograde cholangiogram was performed, revealing a patent CDD. However, the anastomosis was small, and it was dilated to 10 mm, and a temporary biliary stent was placed. The patient did not have recurrence of his symptoms.

**Table 1** Indications for surgery

Underlying disease	N (%)
Pancreatitis	63 (80%)
Cholelithiasis	9 (11%)
Recurrent cholangitis	3 (4%)
CBD injury	2 (3%)
Mirizzi syndrome	1 (1%)
Sclerosing cholangitis	1 (1%)

N=79 in all groups

The other patient with hepatic abscess similarly underwent a CDD secondary to pain from chronic pancreatitis and distal biliary obstruction. The patient also underwent a lateral pancreaticojejunostomy procedure at the same time. The postoperative course was uneventful. Three months postoperatively, however, the patient developed new abdominal pain, and a CT showed a right hepatic lobe abscess. It resolved with percutaneous drainage, and no further intervention was undertaken.

## Discussion

In 1928, Florcken reported 100 cases of CDD with excellent results. He stressed the importance of a large anastomosis to prevent cholangitis,<sup>2</sup> proposing the “more the barium [to pass up through the anastomosis] the better” in postoperative contrasted studies.<sup>3</sup> R.L. Sanders from Memphis, Tennessee presented his series of 25 patients who underwent CDD at the 57th Annual meeting of the Southern Surgical Association in 1945. He noted the effectiveness of CDD in relieving a distal obstruction in both benign and malignant disease.<sup>4</sup> Franklen and colleagues reported the successful performance of laparoscopic CDD in 1991 for a benign common bile duct obstruction.<sup>5</sup> But is CDD a surgery of historic interest only?

**Table 2** Patient symptoms

Symptoms	N (%)
Abdominal pain	63 (80%)
Nausea/vomiting	24 (30%)
Jaundice	10 (13%)
Pruritus	4 (5%)
Fever	4 (5%)
Weight loss	4 (5%)
Diarrhea	2 (3%)
Bleeding	1 (1%)
Fatigue	1 (1%)

N=79 in all groups

**Table 3** Postoperative complications

Complication	N (%)
Abscess	4 (26%)
Wound infection	3 (20%)
UTI	2 (13%)
Biliary leakage	2 (13%)
ECF	2 (13%)
Esophageal bleeding	1 (6%)
Seizure	1 (6%)
SB fistula	1 (6%)
Anastomotic bleeding	1 (6%)
Anastomotic leakage	1 (6%)
Anastomotic ulcer	1 (6%)
Splenic bleeding	1 (6%)
Gastroparesis	1 (6%)

N=15 patients

Postoperative morbidity after CDD is acceptable, reported as ranging from 9.8% to 28%,<sup>2,6,7</sup> consistent with the 17% in this study. The most commonly reported complications are wound infection and biliary leakage, similar to this series, with intraabdominal abscess (26%), wound infection (20%), and biliary leakage (13%).

The concern surrounding CDD lies in the long-term complication of sump syndrome. Sump syndrome is due to reflux of intestinal contents in the biliary tree. It is manifested clinically by infection associated with elevated liver enzymes and is most objectively defined as cholangitis or hepatic abscess. Inadequate stomal size and unfavorable anastomotic configuration resulting in poor biliary drainage are proposed factors leading to sump syndrome.<sup>8</sup> The prevalence of sump syndrome is reported between 0% and 9.6% in prior studies<sup>9–11</sup> and 2.5% in this modern study. Thus, it is a relatively rare occurrence.

Limiting the definition of sump syndrome to cholangitis and hepatic abscess may underreport the occurrence of enterobiliary reflux and any potential subclinical untoward biliary or hepatic pathology. Interestingly, to address these concerns, Mendes De Almeida and colleagues evaluated 35 patients after CDD with endoscopy and did not find inflammatory changes within the biliary tree in long-term follow-up.<sup>6</sup> Evidence for subclinical negative effects is therefore lacking.

The primary treatment of sump syndrome due to stomal stricture is endoscopic balloon cholangioplasty. Caroli-Bosc and colleagues described their experience with 30 patients with sump syndrome managed endoscopically. Presentation was a median of 5 years post surgery. At endoscopy, all patients had food debris (60%), biliary calculi (33%), or both (7%) in the biliary tree. All patients in this series underwent successful endoscopic management.<sup>12</sup> Sump

syndrome, then, is often amenable to minimally invasive, nonoperative interventions.

In an attempt to avoid the dreaded sump syndrome, many surgeons choose to undertake a Roux-en-Y choledochojejunostomy in the management of benign biliary disease. This surgery, however, is arguably more complex and time-consuming. It requires circumferential dissection of the common bile duct, which may be treacherous in the setting of chronic pancreatitis, the indication for surgery in 80% of patients in this study. It also requires an additional small bowel anastomosis, with potential for leakage or internal hernia. Finally, it has potential for Roux limb-associated motility abnormalities, which can also lend to enterobiliary reflux. Postoperative morbidity after choledochojejunostomy for benign disease ranges from 20% to 33% and overall mortality from 0% to 2%.<sup>13–15</sup> Thus, evidence does not suggest that choledochojejunostomy is less morbid than CDD.

## Conclusions

CDD is a safe and effective method of decompressing the distal common bile duct in benign pancreatobiliary disease. Long-term results are acceptable, with sump syndrome being a rare occurrence. CDD should remain a valuable option in the armamentarium of the modern biliary surgeon.

## References

- Hess, Walter. *Textbook of Bilio-pancreatic Diseases*. Padova, Italy: Piccia Nuova Libreria, 1997: 2828
- Escudero-Fabre A, Escallon A et al. *Choledochoduodenostomy: Analysis of 71 cases followed for 5 to 15 years*. *Annals of Surgery*. 1991; 213: 635–642.
- Gupta B. *Choledochoduodenostomy: a study of 28 consecutive cases*. *Kathmandu University Medical Journal*. 2003; 2: 193–197.
- Sanders RL. *Indications for and value of Choledochoduodenostomy*. *Annals of Surgery*. 1946; 3: 847–855.
- Jeyapalan M, Almeida J et al. *Laparoscopic Choledochoduodenostomy: Review of a 4-Year Experience with an Uncommon Problem*. *Surgical Laparoscopy Endoscopy and Percutaneous Techniques*. 2002; 12: 148–153.
- Mendes De Almeida A, Dos Santos N et al. *Choledochoduodenostomy in the Management of Common Duct Stones or Associated Pathology- An Obsolete Method?* *HPB Surgery*. 1996; 10: 27–33.
- Blankensteijn J and Terpstra O. *Early and late results following choledochoduodenostomy and choledochojejunostomy*. *HPB Surgery*. 1990; 2: 151–158.
- Srivengadesh G, Vikram K, and Anathakrishnan N. *Evaluation of long-term results of choledochoduodenostomy for benign biliary obstruction*. *Tropical Gastroenterology*. 2003; 24: 205–207.
- Baker A, Neoptolemos J, Leese T et al. *Long term follow-up of patients with side to side choledochoduodenostomy and transduodenal sphincteroplasty*. *Annals of the Royal College of Surgeons of England*. 1987; 68: 253–257.
- Madden J, Chun J, Kandalaf et al. *Choledochoduodenostomy: an unjustly maligned surgical problem*. *American Journal of Surgery*. 1970; 119: 45–54.
- De Almeida A, Cruz A, Aldeia F. *Side to side choledochodenostomy in the management of cholelithiasis and associated disease: facts and fiction*. *American Journal of Surgery* 1984; 147: 253–259.
- Caroli-Bosc F, Demarquay J et al. *Endoscopic management of sump syndrome after choledochoduodenostomy: retrospective analysis of 30 cases*. *Gastrointestinal Endoscopy*. 2000; 51: 180–183.
- Pitt HA, Kaufman SL, Coleman J. *Benign Postoperative Biliary Strictures*. *Annals of Surgery*. 1989; 4: 417–425.
- Rothlin MA, Lopfe M and Largiader F. *Long-Term Results of Hepaticojejunostomy for Benign Lesions of the Bile Ducts*. *The American Journal of Surgery*. 1998; 1: 22–25.
- Ross CB, H'Doubler WZ, Sharp KW et al. *Recent experience with benign biliary strictures*. *American Surgeon*. 1989; 1: 64–70.