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Cystic Duct Patency in Malignant Obstructive Jaundice

An ERCP-Based Study Relevant to the Role of Laparoscopic Cholecystojejunostomy

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Objective
This endoscopic retrograde cholangiopancreatography-(ERCP)based study estimates the potential role of laparoscopic cholecystojejunostomy for palliation of patients with malignant obstructive jaundice.

Summary Background Data
Traditional treatment of malignant obstructive jaundice has used a standard bilioenteric anastomosis. Laparoscopic biliary bypass via a gallbladder conduit currently is an established technique; it provides a low initial morbidity alternative to open procedures, similar to endoscopic stenting. No study has specifically addressed anatomic factors relevant to cholecystojejunostomy, such as prior cholecystectomy, stricture location in reference to the hepatocystic junction, and cystic duct patency in patients with malignant obstructive jaundice.

Methods
Retrograde cholangiograms were reviewed from consecutive patients with malignant obstructive jaundice and a control group without biliary disease who underwent ERCP during a 2-year period. Patients with either prior biliary surgery or hilar tumors were excluded. The presence of gallbladder or cystic duct filling was assessed. In patients with patent cystic ducts, the distance from obstruction to the cystic duct takeoff was classified as either greater or less than 1 cm.

Results
Nearly half the patients with malignant obstructive jaundice were ineligible for cholecystojejunostomies because of prior biliary surgery (29%) or hilar tumors (17%). Half (50 of 101) of the remaining potential candidates had patent hepatocystic junctions. Patients with ampullary carcinoma and patent hepatocystic junctions (5 of 9) were all ideal candidates for cholecystojejunostomies, having biliary obstruction more than 1 cm from the cystic duct takeoff. Two thirds of the remaining eligible patients (28 of 45) had obstructions less than 1 cm from patent hepatocystic junctions.

Conclusions
Palliation of malignant obstructive jaundice by laparoscopic cholecystojejunostomy should only be attempted after direct cholangiography demonstrates a patent hepatocystic junction that is well separated from the malignant stricture. The majority of patients with malignant obstructive

jaundice are ineligible for cholecystojejunostomies because of prior cholecystectomies, hilar obstructions, or tumor involvement of the hepatocystic junction. Nonoperative treatments will continue to be indicated for the majority of patients with malignant obstructive jaundice.

Less than 20% of patients with pancreatic cancer are candidates for surgical resection because of advanced disease at diagnosis or significant comorbidity.[1-3] The traditional use of surgical bilioenteric anastomoses to relieve malignant obstructive jaundice has been challenged by endoscopic stenting.[4-12] Recurrent jaundice after stent blockage remains a limitation to long-term palliation.[13,14] Laparoscopy is being used increasingly to stage patients with pancreatic and biliary malignancies. Laparoscopic cholecystojejunostomy (CCJ) and gastroenterostomy currently are established techniques[15-17] with potential advantages over both endoscopic stenting and open surgical biliary bypass. A definitive double bypass (biliary and enteric) can be accomplished laparoscopically with low initial morbidity.

Many experts caution against the use of CCJ because of the potential for recurrent jaundice due to tumor encroachment of the hepatocystic junction.[1,18-27] It is recommended that the biliary obstruction be more than 2 cm from the cystic duct takeoff.[27] However, patency of the cystic duct has not been addressed specifically in previous studies. Our aim was to estimate the potential role of CCJ in a cohort of patients with malignant obstructive jaundice. We completed an endoscopic retrograde cholangiopancreatography (ERCP)-based study of biliary anatomy and assumed that patients with cystic duct obstructions or tumors within 1 cm of the hepatocystic junction would be ineligible for CCJ.

METHODS

Consecutive patients with malignant obstructive jaundice who underwent ERCP between January 1, 1992 and December 31, 1993 were identified from the Duke University endoscopic database (GI-Trac). Patients were eligible if they were jaundiced or had elevated alkaline phosphatase with upstream dilatation of the bile ducts. Malignancy was confirmed by tissue diagnosis or by imaging studies accompanied by a typical clinical course. Diagnoses included ampullary carcinoma, cholangiocarcinoma, metastases (causing extrinsic compression of extrahepatic bile ducts), and pancreatic cancer. Patients with prior biliary surgery (cholecystectomy or biliary bypass) were excluded. Survival (weeks) was calculated from the time of first ERCP. A consecutive series of control patients, without jaundice or known biliary tract disease, who underwent ERCP during the same time period, was collected.

Retrograde cholangiograms were reviewed by an experienced radiologist. Patients with hilar obstructions (including common hepatic duct strictures) were excluded from further analysis. The presence of gallbladder or cystic duct filling was recorded for the remaining patients. Those with more than one ERCP were considered to have a patent hepatocystic junction if filling of the gallbladder or cystic duct was observed on any of the cholangiograms. For patients with a patent hepatocystic junction, the distance from the obstruction to the cystic duct takeoff was measured, adjusted for magnification, and categorized as either greater or less than 1 cm. Cholangiograms of the control group (including those with prior cholecystectomy) were reviewed in a similar fashion.

RESULTS

During the 2-year period, 218 patients with malignant obstructive jaundice underwent ERCP at Duke University Medical Center (Fig. 1). Sixty-four patients (36 women, 28 men; mean (±SD) age = 65 ± 13 yrs) had a history of prior biliary surgery (open cholecystectomy [52], laparoscopic cholecystectomy [5], choledochoenterostomy [4], and cholecystoenterostomy [3]). Thirty-six patients (22 women, 14 men; mean (±SD) age = 68 ± 13 yrs) had hilar obstructions.

The remaining 118 patients (57 women, 61 men; mean (±SD) age = 68 ± 12 yrs) were potential candidates for CCJ, having intact gallbladders and nonhilar malignant strictures. Eighty-two (69%) patients had one ERCP. The mean (±SD) number of ERCP studies was 1.8 ± 1.6 per patient. Successful retrograde cholangiograms were obtained in 104 (88%) patients. Reasons for failure included inability to cannulate in nine patients and duodenal obstructions in five (all with pancreatic cancer). Three patients had suboptimal radiographs, leaving 101 retrograde cholangiograms for analysis. Malignancy was confirmed histologically in 82 (69%) patients. Median survival was 22 weeks for 58 patients with histologically confirmed malignancy; 19 patients without histologic confirmation had a similar median survival of 21 weeks. Thirty-six patients were alive at the time of census. Median follow-up was 49 weeks for 23 histologic confirmed cases and 41 weeks for 13 patients

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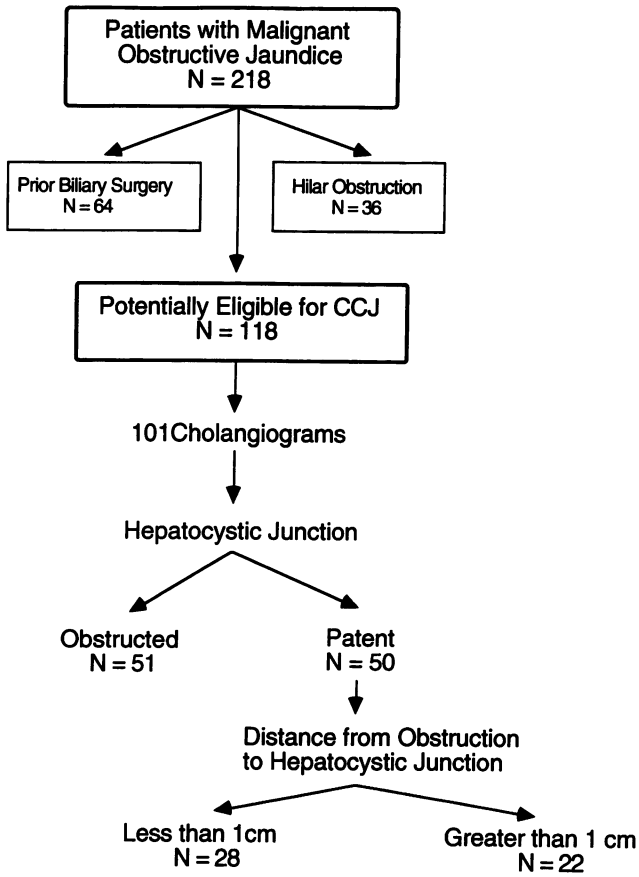

Figure 1. Flow diagram of patients with malignant obstructive jaundice illustrating the anatomic feasibility for palliative cholecystojejunostomy (CCJ). Note that only 22 of 101 potentially eligible patients had patent hepatocystic junctions that were more than 1 cm from the cystic duct junction.

without histologic diagnoses. Five patients were unable to be observed for follow-up.

During the same time period, 54 control group patients (37 women , and 17 men; mean (±SD) age = 52 ± 17 yrs) underwent ERCPs; 25 (46%) of these patients had undergone cholecystectomies previously.

The radiologic findings are shown in Table 1 according to tumor type. Fifty of 101 patients had patent hepatocystic junctions; 56% of these (28 of 50) had filling of the gallbladder or cystic duct, but the hepatocystic junction was within 1 cm (Fig. 2) of the proximal stricture margin. Biliary obstruction was located more than 1 cm below a patent hepatocystic junction (Fig. 3) in 22 of the 101 potentially eligible patients.

Very few (3 of 11) patients with metastatic lesions causing obstructive jaundice had patent hepatocystic junctions; none had an obstruction that was more than 1 cm below the hepatocystic junction. All ampullary carcinoma patients with patent hepatocystic junctions (5 of 9), had obstructions more than 1 cm from the cystic duct takeoff.

The gallbladder failed to fill in 16 of the 50 patients with a patent hepatocystic junction. Cholelithiasis was found in five patients with gallbladder filling. Thirty-six patients had more than one ERCP; 22 of these had patent hepatocystic junctions. Filling of the gallbladder was noted on a subsequent ERCP that was not observed on an earlier study in only 1 of the 22 patients with multiple cholangiograms and a patent hepatocystic junction.

Gallbladder filling occurred in all but one of the control patients with an intact organ. In the single exception, a shrunken gallbladder containing several gallstones was found by ultrasound. The cystic duct remnant filled in all patients who had undergone a cholecystectomy previously.

DISCUSSION

Laparoscopic CCJ for palliation of malignant obstructive jaundice is an attractive concept. It can be performed at the time of staging laparoscopy and can be combined with a gastroenterostomy.[15-17] Fletcher and Jones have suggested that laparoscopic CCJ may eventually replace endoscopic stenting in patients with malignant obstructive jaundice.[15] We used ERCP to investi-

Table 1. ERCP RESULTS PERTAINING TO THE FEASIBILITY OF SUCCESSFUL CHOLECYSTOJEJUNOSTOMY IN PATIENTS WITH MALIGNANT OBSTRUCTIVE JAUNDICE

Hepatocystic Junction (HCJ) Findings	Tumor Causing Malignant Obstructive Jaundice (%)*				
	Pancreatic	Cholangiocarcinoma	Metastatic	Ampullary	Totals
Obstructed HCJ	33 (52)	6 (33)	8 (73)	4 (44)	51 (50)
Patent HCJ < 1 cm from obstruction	17 (27)	8 (45)	3 (27)	0 (0)	28 (28)
Patent HCJ > 1 cm from obstruction	13 (21)	4 (22)	0 (0)	5 (56)	22 (22)
Totals	63	18	11	9	101

* Patients with nonhilar malignant obstruction and no prior biliary surgery.

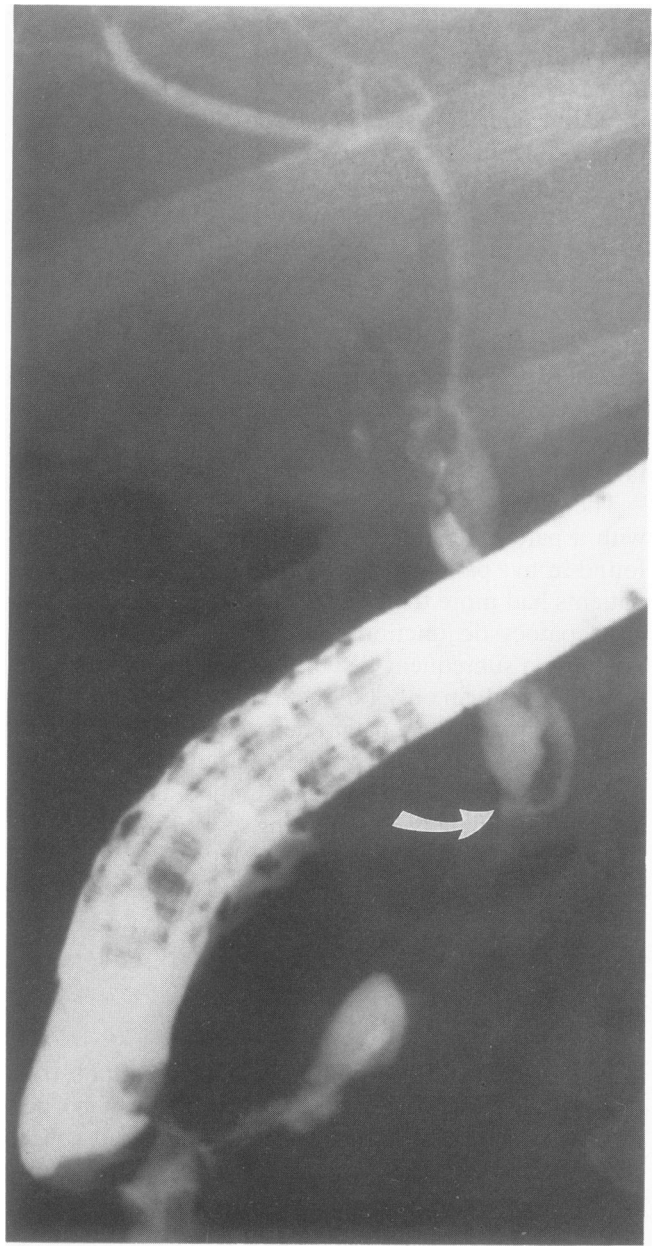

Figure 2. Example of a poor candidate for biliary bypass by cholecystojejunostomy. Despite a patent hepatocystic junction, the cystic duct takeoff is very close to the malignant biliary stricture (arrow).

gate the anatomic feasibility for CCJ in a cohort of patients with malignant obstructive jaundice. It is recommended that CCJ not be performed if a malignant stricture is within 2 to 3 cm of the hepatocystic junction.[27] Using an even less stringent criterion (1 cm), we found that only 22% of the potentially eligible patients were ideal candidates for CCJ.

The generalizability of our results is uncertain. Because this study was performed at a university tertiary referral center, it is possible that we studied patients with particularly advanced disease (referral-filter bias) or patients judged suitable for either the surgical or endoscopic expertise (centripetal bias) available at this center. Patients judged anatomically eligible for CCJ may undergo this procedure elsewhere without being referred to our facility. However, we classified some patients as suitable for CCJ who may not be good candidates for the procedure. Several patients had evidence of diseased gallbladders with cholelithiasis noted during ERCP. Also, the cystic duct was visualized without filling of the gallbladder in almost one third of the patients with malignant obstructive jaundice. Filling of the cystic duct during retrograde cholangiography often occurs after inadvertent direct cannulation of the cystic duct. Thus, cystic duct findings at ERCP are more likely to be biased toward a patent hepatocystic junction, even if partially occluded by tumor.

We have assumed that failure to visualize the gallbladder or cystic duct at ERCP represents occlusion of the hepatocystic junction due to tumor. In support of this,

Figure 3. Example of an ideal candidate for biliary bypass by cholecystojejunostomy. The cystic duct takeoff is several centimeters above the malignant biliary stricture (arrow).

Table 2. FAILURE RATES OF CHOLECYSTOJEJUNOSTOMY FROM RETROSPECTIVE SURGICAL SERIES

Author	Year	No.	Initial Failure	Late Failure	Overall Failure
Bufkin[32]	1967	141	24 (17)	NA	NA
Gallitano[33]	1968	40	NA	NA	14 (35)
Vajayanagar[34]	1970	29	3 (10)	NA	NA
Elmslie[18]	1972	18	NA	1 (6)	NA
Richards[27]	1973	26	1 (4)	1 (4)	2 (8)
Wong[35]	1978	10	2 (20)	NA	NA
Eastman[21]	1980	25	2 (8)	10 (40)	12 (48)
Blievemicht[20]	1980	87	6 (7)	7 (8)	13 (15)
Dayton[36]	1980	49	NA	3 (6)	NA
VanHeerden[37]	1980	76	0 (0)	NA	NA
Ross[28]	1980	46	3 (7)	NA	NA
Brooks[38]	1981	24	0 (0)	0 (0)	0 (0)
Gough[23]	1984	53	7 (13)	7 (13)	14 (26)
Deschamps[39]	1984	20	5 (25)	NA	NA
Ubhi[1]	1986	66*	NA	42 (64)	NA
Schouten[24]	1986	18	NA	5 (27)	NA
Huang[40]	1987	15	NA	1 (7)	NA
Condie[30]	1989	19	NA	2 (10)	NA
Rappaport[31]	1990	48	1 (2)	6 (12)	7 (14)
Potts[41]	1990	32	NA	6 (19)	NA
Singh[2]	1990	74	19 (26)	10 (13)	29 (39)
Mosdell[3]	1991	18*	NA	7 (39)	NA
deRooij[42]	1991	38	6 (16)	NA	NA
Huguier[43]	1993	237*	NA	14 (6)	NA
Total		1209	79/697 (11)	122/809 (15)	91/377 (24)

Failure: Initial = failure to relieve jaundice; Late = recurrent jaundice and/or cholangitis.
Figures in parentheses indicate percentages.
* Does not distinguish between cholecystojejunostomy and cholecystoduodenostomy.
NA: data not available.

cystic duct filling occurred on every ERCP in the control group patients, including those with previous cholecystectomies (filled cystic duct remnant). Conceivably, a patent cystic duct might not fill in a patient with a high-pressure biliary system proximal to a malignant biliary stricture. Nearly one third of the patients had more than one retrograde cholangiogram for stent exchanges when the biliary system was well decompressed. In only one case was filling of the gallbladder noted on a subsequent cholangiogram that was not observed on the initial study.

No study has specifically investigated the extent of hepatocystic junction involvement in a cohort of patients with malignant obstructive jaundice. Despite a paucity of data, it is considered uncommon for palliative CCJ to be precluded by anatomic reasons.[6] In an early study, less than 13% of patients with pancreatic head carcinoma had undergone previous cholecystectomies.[28] The prevalence of prior cholecystectomy (24%) was much higher in the present study. Other series have reported that between 16% and 27% of patients with malignant obstructive jaundice are not candidates for CCJ because of prior cholecystectomies, gallbladder disease, or hepatocystic junction involvement with tumors.[29-30]

The principal advantage of CCJ over choledochoenterostomy is the technical ease of the procedure.[2,3,6,31] The main disadvantage of CCJ is its tendency to fail either initially (persistent jaundice) or subsequently (recurrent jaundice or cholangitis). Various CCJ failure rates have been published (Table 2). From series that specify both early and late results, approximately one fourth of all patients experienced failure to palliate jaundice at some point after CCJ. The prospective failure rate is higher than that reported in retrospective studies and likely reflects better follow-up of patients after surgery. In a single randomized, prospective trial comparing the long-term efficacy of CCJ with choledochoenterostomy, 6 of 12 patients with malignant obstructive jaundice and clear hepatocystic junctions preoperatively experienced late bypass failure after CCJ.[25] The findings of our study would predict a similar late failure rate; 56% of patients with gallbladder or cystic duct filling at ERCP had malignant obstructions within 1 cm of patent hepatocystic junctions.

Endoscopic stenting of malignant biliary strictures is a well-accepted alternative to open surgical biliary bypass.[4,5,10,12,14] Stenting can be performed in patients who are otherwise poor surgical candidates, with low initial morbidity and without precluding later surgical treatment. The presence of duodenal obstruction at diagnosis excludes endoscopic management so that surgery is appropriate. Fortunately, both initial and subsequent development of gastroduodenal outlet obstruction in malignant obstructive jaundice is uncommon. Duodenal obstruction is present at diagnosis in less than 10% of patients with pancreatic cancer.[20,38,44-47] Similarly, 5% of the patients in this series had duodenal obstruction preventing passage of a duodenoscope. In prospective trials, the development of subsequent gastroduodenal obstruction occurs in less than 15% of patients.[4,5,48,49] It is reasonable to offer surgical biliary bypass to those patients with a high likelihood for long-term (greater than 6 months) survival. Poor prognostic factors such as male sex, advanced age, liver metastasis, and large tumor burden can help identify patients that might be better served by endoscopic stenting.[12]

Laparoscopic biliary bypass shares many of the same potential advantages of endoscopic stenting compared with open surgical procedures. The results of the study, however, suggest that laparoscopic CCJ will not successfully palliate the majority of patients with malignant biliary strictures. Although there were few in this study, the subset of ampullary carcinoma patients with a patent hepatocystic junction appeared to be the best candidates for laparoscopic CCJ. New technology may lead to improved techniques, and laparoscopic biliary bypass using the common bile duct may become feasible in the future.

Traditional predictors of successful CCJ were a palpable gallbladder (Courvoisier's sign) or dilatation of the gallbladder on abdominal imaging. Such indirect evidence of cystic duct patency is erroneous when "white bile" is found, and does not predict bypass longevity because the proximity of tumor to the cystic duct takeoff is unknown. Currently, direct cholangiography is the gold standard for imaging the biliary system. Whether newer techniques such as magnetic resonance cholangiography will provide sufficient imaging before laparoscopic staging and treatment in patients with malignant obstructive jaundice remains to be seen.[50] It is likely that the management of these patients will continue to depend on the cooperative efforts of surgeons, gastroenterologists, and radiologists.[7,41,51]

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