Long-Term Results of Large Diameter Hepaticojejunostomy for Treatment of Bile Duct Injuries Following Cholecystectomy

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Objective: *Bile Duct Injury (BDI) is one of the most serious complications of cholecystectomy. The authors analyzed the clinical presentation, surgical management and long-term outcome of 19 patients presenting with iatrogenic major BDIs (Straburg type E) following cholecystectomy who underwent Roux-en-Y hepaticojejunostomy.*

Material and Method: *Between 1992 and 2005, 19 patients with major BDIs (Strasberg type E) following cholecystectomy were included. Operative notes and charts of all patients were reviewed systematically. A follow-up examination of each patient was performed after a median of 22 months (range 1-120).*

Results: *Twelve patients presented with ascending cholangitis, two patients were referred to the hospital with biliary-cutaneous fistula and five patients (26.3%) were identified at the time of operations. All patients were treated with Roux-en-Y hepaticojejunostomy with at least 2 cm of the diameter of the biliary-enteric anastomosis. There was no postoperative mortality. Postoperative complication was found in 5 patients (26.3%). Until now, during the follow-up, neither clinical nor biochemical evidence of recurrent cholangitis has been found.*

Conclusion: *Major BDIs are associated with high morbidity rate and prolonged hospitalization. Early detection and referral to an experienced center is crucial in the management of these patients. Roux-en-Y hepaticojejunostomy with large diameter of the biliary-enteric anastomosis is the surgical procedure of choice with good long-term outcome.*

Keywords: *Bile duct injury, Cholecystectomy, Hepaticojejunostomy*

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Major BDI is the most serious complication of cholecystectomy. The estimated incidence of major BDIs was 0.1% to 0.6%[1-3]. In Thailand, the incidence of BDI following Laparoscopic Cholecystectomy (LC) has been reported as 0.29% in a small retrospective study[4]. These injuries cause significant morbidity and mortality leading to a significant economic impact[5].

Although the surgical management of major BDIs and short-term follow-up has been reported, long-term outcome knowledge is limited. The goal of the present report is to describe the surgical technique and provide long-term outcome analysis of major BDIs treated with large diameter of Roux-en-Y hepaticojejunostomy. The present report is the largest in a series of surgical management of major BDIs in Thailand so far.

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Material and Method

Data were collected prospectively on 19 patients with major BDIs after cholecystectomy treated at the Division of General Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand, between November 1992 and July 2005. All patients underwent Roux-en-Y

hepaticojejunostomy with large diameter of biliary-enteric anastomosis. The technique is described. Major BDI was classified as Strasberg type E[6] (Fig. 1). Minor leaks from the cystic duct or gallbladder bed were excluded. Patients with bile duct strictures from benign inflammatory processes such as chronic pancreatitis, gallstones, stenosis of the sphincter of Oddi, biliary tract infections, duodenal ulcers, primary sclerosing cholangitis, as well as strictures from malignancy were excluded.

All patients, who were diagnosed after the cholecystectomy, underwent preoperative imaging study with Magnetic Resonance CholangioPancreaticography (MRCP) (Fig. 2), Endoscopic Retrograde CholangioPancreaticography (ERCP) (Fig. 3) and/or Percutaneous Transhepatic Cholangiography (PTC)

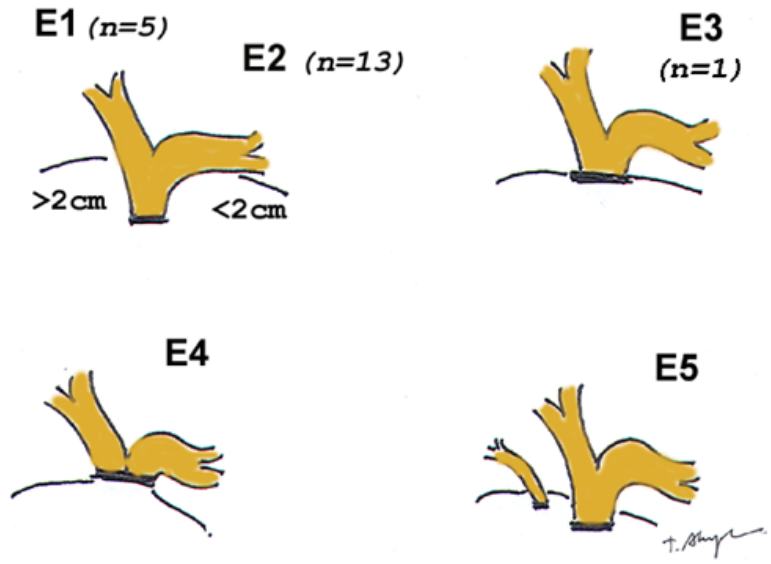

Fig. 1 The classification of Strasberg type E

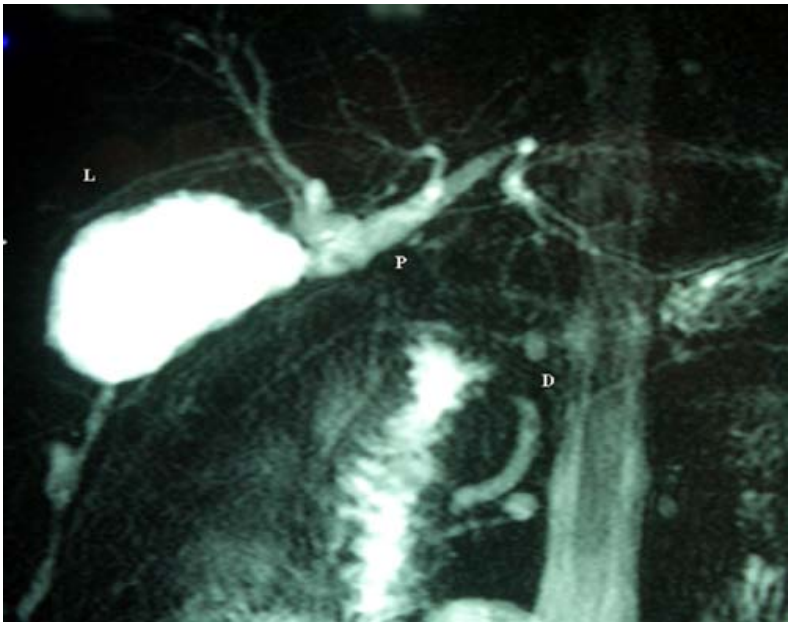

Fig. 2 MRCP showed major CBDI (type E3), bile leakage (L) from proximal bile duct stump (P) and distal part of CBD (D)

Fig. 3 Cholangiogram revealed multiple hemoclips at proximal part of CBD with complete arrest of contrast media

before surgical treatment based on type of the lesion and presenting symptoms. Follow-up was conducted by medical record review or telephone interview.

Surgical technique

The operative technique is directed at obtaining a tension-free mucosa-to-mucosa Roux-en-Y hepaticojejunostomy anastomosis. A defunctionalized jejunal limb greater than 40 cm. is regarded mandatory to prevent the flow of alimentary material into the biliary tree. The authors almost always dissected the proximal part of Common Hepatic Duct (CHD) until the anastomosis could be performed at least 2 cm in diameter. If the anastomosis is performed with a non-dilated duct, a satisfactory length for anastomosis (2 cm) can be obtained by lowering the hilar plate (incision of Glisson's capsule at the posterior border of the quadrate lobe gives access to the superior aspect of the hilar plate) and further extending the opening on the anterior part of the CHD into the left duct. Absorbable sutures No. 3/0 are placed in an interrupted fashion. This is facilitated by placing an anterior row through the proximal duct, to provide exposure for placement of the posterior row of sutures between the duct and jejunum (Fig. 4). Once the posterior row has been completed, the anterior sutures can be passed through the intestine and tied. An end-to-side anastomosis between the proximal bile duct and an antimesenteric opening in the Roux limb of the jejunum avoids the problem of disparity in size associated with an end-to-end anastomosis. Finally a Penrose drain was routinely placed in the hepatorenal pouch.

The patients' status was rated as no recurrence of stenosis if there were no symptoms of fever, jaundice or ascending cholangitis and normal results of liver function test. Patients classified as either excellent or good were considered to be treatment success. Patients were not considered to have successful drainage if an invasive procedure, either radiologic, endoscopic or surgical, was necessary to treat ongoing symptoms or strictures recurrence[7].

The data were analysed with SPSS software (version 10.0 for Windows). Mann Whitney U-test and

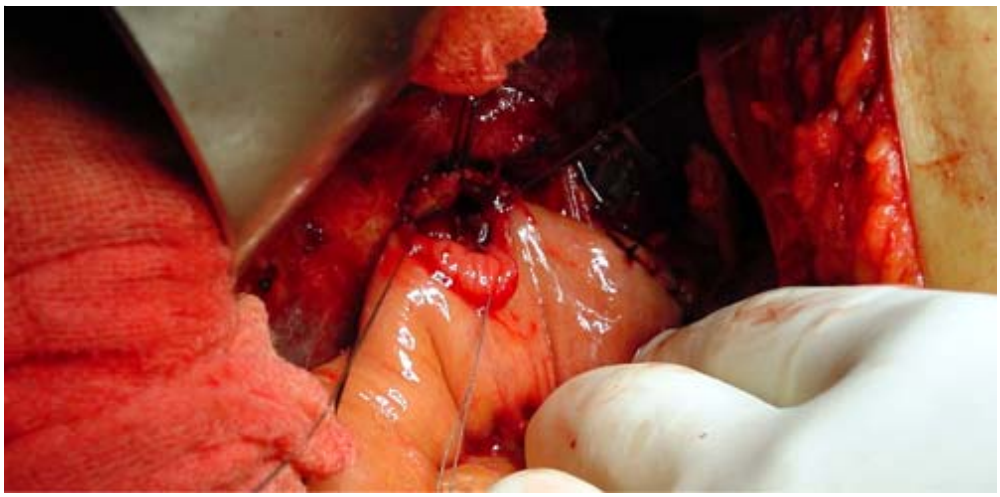

Fig. 4 Large diameter of Roux-en-Y hepaticojejunostomy anastomosis was created

Fishers' Exact test to compare data without normal distribution. A *p*-value of less than 0.05 was considered statistically significant.

Results

Roux-en-Y hepaticojejunostomy anastomosis with a large diameter was applied to all 19 patients with major BDIs in the technique as described. There were 13 women and 6 men with a median age of 48 years (range 30 to 79 years). The indication for cholecystectomy was symptomatic GS, 14 patients (73.7%); chronic cholecystitis, 2 patients (10.53%); acute cholecystitis, 2 patients (10.5%); and CBD stone, 1 patient (5.3%). Open Cholecystectomy (OC) was performed in 10 patients (52.6%) and LC was in 9 patients (47.4%). The Straberg classification of major BDIs was type E1 in 26.3%, E2 in 68.4% and E3 in 5.3% (Table 1). The patients were divided into two groups according to timing of diagnosis of BDIs. Group A (major BDIs were identified at the time of the operation) included 5 patients (26.3%) and group B (major BDIs were diagnosed after the operation) included 14 patients (73.7%) with mean of 71.3 days. In group B, these patients presented with jaundice (57.1%), cholangitis (28.6%) and bile leakage (14.3%).

The mean postoperative hospitalization time was 20 days (range 7 to 66 days). Early post operative morbidity occurred in 5 out of 19 patients (26.3%). Subhepatic collection occurred in one patient (5.3%). Superficial surgical site infection was found in two patients (10.5%). Two (10.5%) patients developed upper GI bleeding and were treated with conservative treatment (Table 2). There was no postoperative mortality. The follow-up period was 22 months (median) with a range of 1-120 months. None of the patients needed re-hospitalization or any re-operation due to stricture of biliry-enteric anastomosis or ascending cholangitis.

Table 1. Characteristics of patients

	Number (%)
Patients	19
Male/Female	6/13
Indications for cholecystectomy	
Symptomatic GS	14 (73.7)
Acute cholecystitis	2 (10.5)
Symptomatic GS with CBD stone	1 (5.3)
Chronic cholecystitis	2 (10.5)
Primary operation	
Opened cholecystectomy (OC)	10 (52.6)
Laparoscopic cholecystectomy (LC)	9 (47.4)
Diagnosis	
Intra-operation (Group A)	5 (26.3)
Post-operation (Group B)	14 (73.7)
Presenting symptoms	
Jaundice	8 (57.1)
Cholangitis	4 (28.6)
Bile leakage	2 (14.3)
Type of BDI	
Strasberg E1	5 (26.3)
Strasberg E2	13 (68.4)
Strasberg E3	1 (5.3)

Table 2. Early postoperative complications

Complications	No. (%)
Surgical site infection	2 (10.5%)
Upper GI bleeding	2 (10.5%)
Subhepatic collection	1 (5.3%)

Discussion

Despite improvements in surgical technology, major BDI continues to be a significant clinical challenge. The prolonged, complicated, and unexpected nature of these injuries may also affect the quality of life[8]. Proper diagnosis and appropriate treatment of major BDI are important in preventing life-threatening complications of cholangitis, biliary cirrhosis, portal hypertension, end-stage liver disease, and death.

The control of sepsis and the ongoing bile leak is the primary goal of the initial management of a major BDI. If this can be accomplished, proceeding with surgical reconstruction is not urgent. In fact, reconstruction in the period of peritonitis portends a statistically worse outcome[9].

From a large retrospective study, 175 patients of BDIs underwent surgical management with a complication rate of 42.9%[10]. In the presented series, 26.32% of patients had complications in the perioperative period. All of these complications were managed conservatively and, therefore, no patient required reoperation in the perioperative period.

The present study consisted of two separate populations. Patients with BDI discovered intraoperatively and who underwent immediate reconstruction were in group A. Patients that were diagnosed after the cholecystectomy procedure were in group B (late

Table 3. Long-term outcome of large diameter Roux-en-Y hepaticojejunostomy

	Group A N = 5	Group B N = 14	p
Timing from injury to reconstruction (days)	0	71.30 ± 91.48	<0.05
Postoperative hospitalization (days)	12.00 ± 3.94	22.29 ± 15.57	ns
Successful drainage (%)	100	100	ns
Early postoperative morbidity (%)	20	28.6	ns
Recurrence of ascending cholangitis (%)	0	0	ns
Mortality (%)	0	0	ns

reconstruction). The present study showed that Group A had shorter hospitalization than Group B (Table 3) without statistical significance. One patient in group B developed subhepatic collection and was treated with percutaneous drainage and needed long hospitalization. Diagnostic and therapeutic courses are given on the basis of the type of lesion, clinical presentation and the timing of reconstruction. The authors emphasize the importance of timing (i.e., carrying out surgical reconstruction as soon as possible) and of large diameter Roux-en-Y hepaticojejunostomy to defined technical principles. The present results suggest that high patency rates in long term follow-up can be achieved and support the feasibility of such procedures. The present study revealed good long-term results of large diameter Roux-en-Y hepaticojejunostomy without recurrence of ascending cholangitis, stricture or any postoperative mortality.

Laparoscopic biliary reconstruction is also feasible[11], but it entails long operative times and requires advanced laparoscopic technical skills as well as significant experience in hepatobiliary surgery. Further studies on larger groups of patients will be necessary to accurately determine long-term patency rates of laparoscopic biliary-enteric anastomoses. So far the authors have not used this technique in our study.

Surgery is considered the treatment of choice for bile duct injury. Recently, endoscopic stent placement has been proposed as an alternative to surgical management in selected patients. Endoscopic management of simple fistulas and incomplete lesions of the common bile duct is the preferred approach[12,13]. However, in case of major BDI, surgery provides a better long-term outcome over endoscopy.

Moreover, the authors believe that surgical management at a hepatobiliary center with multidis-ciplinary competence greatly influences the final long-term outcome.

In conclusion, major BDIs (Strasberg type E) remain a considerable surgical challenge. Nevertheless, complex biliary reconstructive procedures can be completed with minimal morbidity. Surgical management with large diameter of Roux-en-Y hepaticojejunostomy and the meticulous suture technique are required for successful long-term outcome.

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ผลระยะยาวของการผ่าตัดเชื่อมระหว่างท่อน้ำดีร่วมในตับและลำไส้เล็กเจจูนัมด้วยเส้นผ่าศูนย์กลางขนาดใหญ่ สำหรับรักษาการบาดเจ็บของท่อน้ำดีภายหลังการผ่าตัดถุงน้ำดี

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วัตถุประสงค์*: การบาดเจ็บของท่อน้ำดีเป็นภาวะแทรกซ้อนที่รุนแรงที่สุดอย่างหนึ่งภายหลังการผ่าตัดถุงน้ำดี คณะผู้วิจัยได้ทำการศึกษาอาการแสดงทางคลินิก, วิธีการผ่าตัด และผลระยะยาวของการผ่าตัดเชื่อมระหว่างท่อน้ำดีร่วมในตับและลำไส้เล็กเจจูนัม ในผู้ป่วยที่ได้รับบาดเจ็บของท่อน้ำดีภายหลังการผ่าตัดถุงน้ำดี*

วัสดุและวิธีการ*: การศึกษาย้อนหลังในผู้ป่วยจำนวน 19 ราย ระหว่างปีพ.ศ.2535 ถึง พ.ศ.2548 ค่ากลางของระยะเวลาการติดตาม เท่ากับ 22 เดือน*

ผลการศึกษา*: มีผู้ป่วยจำนวน 12 ราย ที่มาพบแพทย์ด้วยอาการของการติดเชื้อทางเดินน้ำดี ผู้ป่วย 2 รายถูกส่งตัวมาจากโรงพยาบาลอื่นด้วยอาการของทางทะลุระหว่างทางเดินน้ำดีและผิวหนัง ผู้ป่วย 5 รายได้รับการวินิจฉัยในขณะที่ทำการผ่าตัด ผู้ป่วยทุกรายได้รับการผ่าตัดรักษาโดยการทำผ่าตัดเชื่อมระหว่างท่อน้ำดีร่วมในตับและลำไส้เล็กเจจูนัมด้วยเส้นผ่าศูนย์กลางขนาด 2 เซนติเมตร โดยที่ไม่มีผู้ป่วยเสียชีวิตจากการผ่าตัด เกิดผลแทรกซ้อนภายหลังการผ่าตัด 5 รายในปัจจุบันผู้ป่วยทุกรายมีอาการเป็นปกติ*

สรุป*: การบาดเจ็บของท่อทางเดินน้ำดีร่วมสัมพันธ์กับอัตราการเสียชีวิตสูงและอาจต้องอยู่โรงพยาบาลเป็นระยะเวลานาน การให้การวินิจฉัยในระยะต้นและส่งต่อผู้ป่วยไปยังศูนย์การรักษาที่มีความชำนาญ มีความสำคัญในการให้การรักษาแก่ผู้ป่วย การผ่าตัดรักษาโดยการทำผ่าตัดเชื่อมระหว่างท่อน้ำดีร่วมในตับและลำไส้เล็กเจจูนัมด้วยเส้นผ่าศูนย์กลางขนาดใหญ่เป็นวิธีการผ่าตัดที่เหมาะสม ทำให้ได้ผลการรักษาดีในระยะยาว*