Biliary tract injury during cholecystectomy: a retrospective descriptive review of clinical features, treatment and outcome

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(Index words: Bismuth classification, endoscopic stenting, surgical procedures)

Background

Bile duct injury is the most dreaded complication of cholecystectomy. Bile duct injuries are associated with high morbidity and mortality. Untreated bile duct injury almost certainly leads to death.

Objective To review the experience in our unit with regard to management and outcome of cholecystectomy-associated bile duct injuries.

Design Retrospective descriptive study

Setting Patients referred to a tertiary referral unit with suspected bile duct injuries from May 2002 to September 2006.

Materials and methods 29 patients with iatrogenic biliary tract injuries were reviewed with regard to the clinical presentation, nature of the injury, type of interventional procedure and outcome.

Results Mean age of the sample was 42.8 years. (SD 13.8). Twenty four were women; 15 patients had undergone open cholecystectomy and 14 by laparoscopy. Five injuries were detected intra-operatively, whereas 19 patients presented within two weeks, and 5 after two weeks. Clinical presentations were jaundice (8), biliary fistula (7), acute abdomen (7) and cholangitis (2). Twenty five endoscopic retrograde cholangio-pancreaticograms (ERCP) were performed of which 44% had complete cutoffs. Bismuth type 1 injuries were seen in 8 patients and 7 had type II injuries. Type III and type IV injuries were seen in 8 and 5 patients respectively. Of the 29, 9 had endoscopic stenting and 13 hepatico-jejunostomy as the definitive treatment. All patients managed by endoscopic stenting are asymptomatic. Of the hepatico-jejunostomy patients, 9 are asymptomatic, and 4 are symptomatic. Of the latter group three have undergone repeat hepatico-jejunostomy. There was one procedure related mortality in a patient with type IV injury.

Conclusions In selected patients, hepatico-jejunostomy and endoscopic placement of stents appear to be equally effective in establishing continuity of biliary flow. Long term results are satisfactory.

Introduction

Cholecystectomy is one of the commonest elective operations performed by surgeons worldwide. Open cholecystectomy was regarded as the gold standard treatment for symptomatic gallstone disease for well over a century. Laparoscopic cholecystectomy, introduced in 1987, soon replaced open surgery mainly due to high patient demand. At present, the laparoscopic approach is considered as the treatment of choice for symptomatic gallstones. The initial enthusiasm for the laparoscopic approach was dampened somewhat by an increased incidence of bile duct injuries. This was initially attributed to poor supervision and a learning curve effect [1]. Bile duct injury was a well recognized complication even of open cholecystectomy. With increasing experience, the incidence of this complication has fallen to an acceptable level of 0.2% [2]. The start of the laparoscopic approach was no different. In the initial period, injury rates as high as 2.2% were reported but with the experience, the rates have fallen to between 0.3 and 0.6% [3]. Still, the overall injury rate remains 2 to 4 times higher than for open cholecystectomy [1, 4]. Bile duct injuries are associated with high morbidity and mortality. Expertise is needed for satisfactory reconstruction of the injured bile duct. There are no reports in Sri Lanka on bile duct injury after the introduction of laparoscopic cholecystectomy.

Patients and methods

A retrospective review of our database was performed on all patients referred to the unit for management of iatrogenic bile duct injuries during the period May 2002 to September 2006. Data were reviewed with regard to patient demographics, time from injury to injury recognition, clinical presentation, type of injury, management and outcome. All the injuries had occurred following open or laparoscopic cholecystectomy performed for symptomatic gallstone disease. For the purpose of analysis, clinical presentations were classified in to three groups – injuries detected intra-operatively, within two weeks of surgery and after two weeks. Injuries were classified according to the Bismuth classification based on ERCP imaging, percutaneous transhepatic cholangiogram (PTC) and intra-operative findings.

ERCPs were performed on most of the patients, but PTC was done on selected patients where ERCP failed or

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when there was evidence of total cutoff on ERCP. Patients with strictures that were negotiable with the guide-wire underwent stricture dilation and endoscopic placement of biliary stents. Strictures that were not negotiable, strictures following complete transection and patients with post-hepatico-jejunostomy strictures were offered hepatico-jejunostomy as the definitive treatment. Endoscopy stenting required stent exchange every 6 months until satisfactory dilation of the stricture was achieved. Duration of follow up was calculated from the date of definitive surgery or endoscopic stenting.

Patients were followed up at 1, 3, 6, 8 and 12 months, or more frequently if they were symptomatic. Long term follow up was based on the clinical symptoms and liver function tests during outpatient visits. Ultrasound scans, CT scans and PTCs were performed when indicated. All patients were recalled for assessment as outpatients. Patients who had post-treatment cholangitis, jaundice or recurrent abdominal pain were considered as treatment failures.

Results

Demographics

29 patients (25women) referred to our unit with iatrogenic bile duct injuries were reviewed. There were 15 patients following open and 14 after laparoscopic cholecystectomy. Their ages ranged from 20-80 years. Of these, 27 patients were between 20 and 50, and 2 were above 60.

Presentation

Three groups were identified based on the time interval between the surgery and the time of the bile duct injury. In 5 patients bile duct injury was recognized during the surgical procedure, in 19 within two weeks, and in 5 after two weeks of surgery.

Type of injury

ERCP was the main investigation employed to identify the site and severity of the bile duct injury. A total of 25 ERCPs were performed with a success rate of 88%. 11 patients also had PTCs. Bismuth classification was used to assess the severity of the injury.

Table 1 summarises the main findings, procedures and outcome of patients in the laparoscopic cholecystectomy group and Table 2 in the open cholecystectomy group.

Treatment

As shown in Table 1 and 2, 5 patients from laparoscopic cholecystectomy group and 8 patients from open cholecystectomy group underwent hepatico-jejunostomy as the definitive treatment. 11 of them also underwent creation of gastric access loops where the free end of the jejunal roux loop is anastomosed to the stomach as shown in Figure 1.

Nine patients (6 from laparoscopy group and 3 from open cholecystectomy group) underwent endoscopic stenting. A plastic stent was placed across the defect and stent exchanges were carried out at about six month intervals. One patient had the stent removed after 4 exchanges as the stricture was sufficiently dilated.

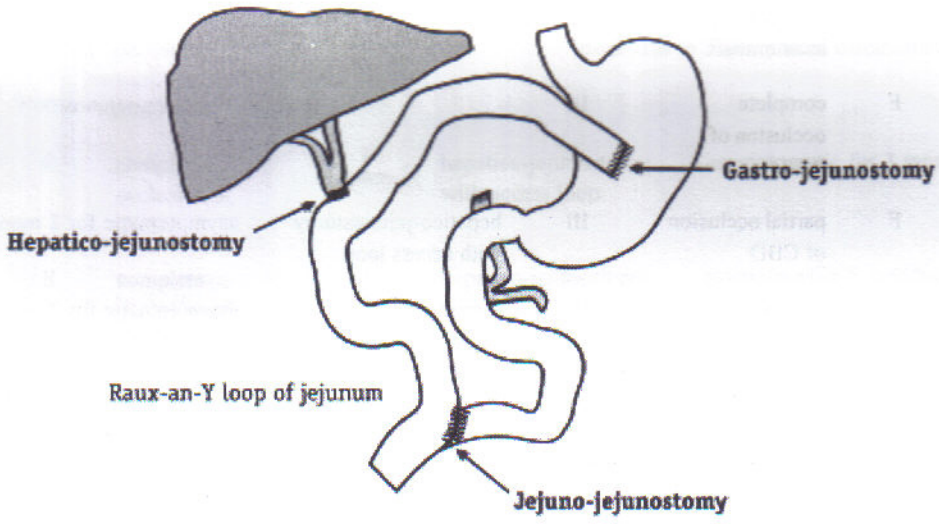

Figure 1. **Hepatico-jejunostomy with gastric access loop.**

Table 1. **Main findings of the patients after laparoscopic cholecystectomy (CBD-common bile duct)**

No:	*Age years*	*Sex*	*ERCP/ PTC findings*	*Bismuth type*	*Type of intervention*	*Outcome*
1	36	F	complete occlusion of CBD	IV	transfer back to original referral centre	
2	80	M	partial occlusion of CBD	I	stenting	asymptomatic for 34 months
3	38	F	complete occlusion of CBD	I	stenting	asymptomatic for 33 months
4	47	F	partial occlusion of CBD	I	stenting	asymptomatic for 30 months
5	25	F	leak of contrast medium	I	stenting	asymptomatic for 29 months
6	22	M	complete occlusion of CBD	II	hepatico-jejunostomy with access loop	asymptomatic for 18 months
7	28	F	complete occlusion of CBD	III	hepatico-jejunostomy with access loop	asymptomatic for 13 months
8	45	F	complete occlusion of CBD	II	hepatico-jejunostomy	cholangitis after 3 months of primary surgery. Revision hepatico-jejunostomy with access loop
9	38	F	complete occlusion of CBD	IV	death 48 hours after attempted corrective surgery	
10	43	F	complete occlusion of hepatico-jejunostomy anastomosis	III	hepatico-jejunostomy	recurrent abdominal pain after 24 months of primary surgery. Revision hepatico-jejunostomy with access loop done asymptomatic for 9 months
11	27	F	complete occlusion of CBD	III	awaiting hepatico-jejunostomy	
12	52	F	partial occlusion of CBD	III	hepatico-jejunostomy with access loop	asymptomatic for 2 months
13	26	M	leak of contrast medium	III	stenting	asymptomatic for 2 months
14	42	F	leak of contrast medium	I	stenting	asymptomatic for 23 months

Table 2. **Main findings of the patients after open cholecystectomy (CBD-common bile duct)**

No:	*Age years*	*Sex*	*ERCP/PTC findings*	*Bismuth type*	*Type of intervention*	*Outcome*
1	53	F	complete occlusion of CBD			transfer back to original referral centre
2	42	F	leak of contrast medium	III	stenting	asymptomatic for 36 months
3	26	F	complete occlusion of CBD	II		transfer back to original referral centre
4	28	F	complete occlusion of CBD	I	hepatico-jejunostomy	recurrent abdominal pain 15 months after surgery. Awaits revision
5	39	F	failed cannulation	II	hepatico-jejunostomy with access loop	asymptomatic for 16 months
6	49	F	complete occlusion of CBD	IV		transfer back to original referral centre
7	60	M	complete occlusion of CBD	II	hepatico-jejunostomy	asymptomatic for 18 months
8	42	F	partial cclusion of CBD	II	stenting	asymptomatic for 23 months
9	55	M	complete occlusion of CBD	III	hepatico-jejunostomy with access loop	asymptomatic for 15 months
10	62	F	complete occlusion of CBD	II	hepatico-jejunostomy with access loop	asymptomatic for 10 months
11	27	F	partial occlusion of CBD	IV		death due to disseminated carcinoma of ovary
12	48	F	complete occlusion of CBD	I	hepatico-jejunostomy with access loop	asymptomatic for 3 months
13	38	F	complete occlusion of CBD	I	hepatico-jejunostomy with access loop	asymptomatic 6 months
14	34	F	complete occlusion of CBD	IV	hepatico-jejunostomy	cholangitis after 24 months of primary surgery. Revision hepatico-jejunostomy with access loop asymptomatic for 2 months
15	31	F	partial occlusion of CBD	III	stenting	asymptomatic for 5 months

Outcomes

Patients who underwent stenting, all remain asymptomatic with regular stent exchanges.

Longest follow up was 36 weeks. Longest follow up period of patients who underwent hepatico-jejunostomy was 2 years. Of these, 9 remain asymptomatic, 4 had significant symptoms and 3 had revision hepatico-jejunostomy. Two died. One patient died of advanced ovarian malignancy while awaiting intervention and the other died 48 hours after attempted corrective surgery. In this patient hepatico-jejunostomy was rendered impossible by grossly distorted anatomy after a type IV bile duct injury.

Discussion

Reconstruction of the bile duct is associated with stricture formation even in expert hands [5]. Economic implications are considerable [6]. In our study group, 27 patients were between 20-50 years, the most economically productive age group in the society.

Although reported rates of laparoscopic bile duct injuries are 2 to 4 times higher than open method, our study group had nearly the same number of injuries (15) following open cholecystectomy as the laparoscopic method (14). This is because open cholecystectomy is still the commonest operation performed for gallstone disease in Sri Lanka. 7 out of 15 in the laparoscopic cholecystectomy group and 6 out of 15 injuries in the open cholecystectomy group were of Bismuth type III and IV. Therefore with regard to the severity of injury, laparoscopic bile duct injuries and injuries due to open cholecystectomy did not show a significant difference.

Majority of injuries (19) were recognized within 2 weeks of cholecystectomy and only 5 were recognized during surgery. Other studies have also reported intra-operative detection only in about a third of patients following laparoscopic cholecystectomy [7]. However we fail to understand why only 2 out of 15 injuries from the open cholecystectomy group were detected intraoperatively.

ERCP is a useful diagnostic and therapeutic procedure in the management of bile duct injury. It identifies the level and degree of injury, and stenting helps to abort bile leakage and biliary sepsis. All 9 patients who underwent stenting following ERCP had satisfactory outcomes. Stenting is possible only in injuries where bile duct continuity is present. 5 out of 6 patients who underwent stenting in the laparoscopy group had Bismuth type I injury. However 2 out of 3 in the open cholecystectomy group who underwent stenting had Bismuth type III injury. In general, the better outcome observed in patients who underwent stenting is probably because they had less severe injuries.

All patients who had complex injuries and those with complete transections underwent hepatico-jejunostomy. Three patients who presented with anastomotic strictures following hepatico-jejunostomy performed elsewhere did not have access loops. Access loops provide access to the anastomosis, which is mandatory to plan the definitive treatment. This encouraged us to devise gastric access loops. A gastric access loop allows the surgeon endoscopic access to the site of the stricture and provides an opportunity to perform endoscopic balloon dilation. Jejunal access is the usual technique employed by many surgeons and provides access for the interventional radiologist to the site of the stricture and the opportunity for dilation. [8] We preferred gastric access over the conventional jejunal access because of the limitation of radiological facilities and limited availability of therapeutic radiologists to undertake the management of strictures following hepatico-jejunostomy. Creation of access to the anastomosis from the stomach raises the issue of bile gastritis.

During follow up, we had no patients with gastric access loops presenting with symptomatic bile gastritis.

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