

Iatrogenic Bile Duct Injury: Hours of Joy, Moment of Terror

Cheah Sin Dee¹, Azhar Amir Hamzah¹, Tauqeer Hussain Mallhi^{2*}, Yusra Habib Khan³, Malik Hassan Mehmood⁴, Amer Hayat Khan⁵

Abstract: Iatrogenic bile duct injuries following gallbladder surgery are one of the most challenging intricacies. These injuries are accompanied by considerable patient disability and increased healthcare cost. Two dimensional imaging, potential tenting of the common hepatic duct during retraction of the neck of the gallbladder, absence of tactile sensation, acute cholecystitis and a short cystic duct are some manifestations of laparoscopic cholecystectomy that pose considerable burden to patients. We present a case of a 48 years old lady, who underwent laparoscopic cholecystectomy following accidental bile duct injury. Immediate response to complication and prompt salvage surgery resulted in patient's survival.

Keywords: Iatrogenic, Bile Duct Injury, Hepaticojejunostomy, Jejunogastrojejunostomy

1. Urology Unit, Department of Surgery, Hospital Universiti Sains Malaysia, Kelantan, Malaysia
2. Department of Pharmacy Practice, Faculty of Pharmaceutical Sciences, GC University Faisalabad, Pakistan
3. Institute of Pharmacy, Lahore College for Women University, Lahore, Pakistan
4. Department of Pharmacology, Faculty of Pharmaceutical Sciences, GC University Faisalabad, Pakistan
5. Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia

Corresponding author email:

tauqeer.hussain.mallhi@hotmail.com

INTRODUCTION

Iatrogenic bile duct injuries (IBDI) are considered an important issue in gastric and intestinal surgery. Laparoscopic cholecystectomy, a most common surgical procedure around the globe, is a frequent cause of IBDI. The early diagnosis of IBDI is of paramount importance for surgeons and gastroenterologists because unrecognized cases may lead to serious complications including biliary cirrhosis, hepatic failure and death. Laboratory investigations and radiological findings play a pivotal role during diagnostic workup of biliary injuries (1). In current case, we discuss accidental bile duct injury following laparoscopic cholecystectomy.

CASE REPORT

A 48 year old lady was referred to department of surgery, Hospital Universiti Sains Malaysia, one week after laparoscopic cholecystectomy for iatrogenic bile duct injury. This problem initiated two months prior to the surgery with symptoms of epigastric pain, fever, jaundice, dark coloured urine and pale stool pointing to a diagnosis of ascending cholangitis with obstructive jaundice. Ultrasound hepatobiliary system showed a dilated common bile duct measuring 1.2 cm without any stone, distended gallbladder and multiple cholelithiasis. She was treated with IV Cefoperazone 1 gram twice a day and IV Metronidazole 500 mg three times a day for one week. Endoscopic retrograde cholangiopancreatography (ERCP) was performed showing mildly dilated common bile duct with choledocholithiasis which was removed during the procedure.

She subsequently underwent a laparoscopic cholecystectomy and was discharged from the hospital on day 3 postoperatively. However, this patient presented

after one week of discharge with jaundice, upper abdominal pain and abdominal distension. Her vital signs were stable and she was afebrile but deeply jaundiced. Abdominal examination showed distension, tenderness at epigastric and right hypochondriac regions and fluid thrill.

Complete blood count demonstrated WBC $10.4 \times 10^9/L$, Hb 13.1 g/L, platelets count $398 \times 10^9/L$, INR 1.12, Bilirubin 99 $\mu\text{mol/L}$, ALP 352 IU/L, ALT 77 IU/L, AST 52 IU/L, urea 3.6 mmol/L, serum creatinine 48 $\mu\text{mol/L}$ and amylase 172 U/L. Abdominal ultrasound findings showed no evidence of dilated biliary tree and have normal common bile duct measuring 3mm and gross ascites. ERCP revealed sudden stop in contrast flow below clips and inability to pass guide wire beyond the clips with impression of completely transected common bile duct (Bismuth IV class).

We performed an emergency laparotomy with hepaticojejunostomy and jejunogastrojejunostomy. Intraoperatively, there were two 5mm clips at common hepatic duct almost completely traversing the whole lumen with leakage of bile from the common hepatic duct stump in between the 2 clips. Total intraperitoneal bile collection was 1.5 litres. The common hepatic duct stump was more than 2cm long from the confluence of right and left hepatic ducts (Bismuth I class). Patient showed good postoperative recovery. Fluids were administered on day 3 postoperatively and solid food was given on day 5. Intravenous antibiotics were given for one week. Patient demonstrated resolution of symptoms following treatment and liver function tests were substantially improved on day 4 postoperatively i.e. bilirubin 33 $\mu\text{mol/L}$, ALP 204 IU/L, ALT 25 IU/L and AST 23 IU/L.

DISCUSSION

Extrahepatic biliary tree injury is most common due to iatrogenic cause during cholecystectomy. Abdominal trauma, injection of scolicalid agents in hydatid cyst management and radiotherapy are some other causes of biliary tree injury. The incidence of laparoscopic cholecystectomy ranges from 0.3 – 0.7 % (1) while incidence for open cholecystectomy is 0.13 % (2, 3). The hazards of bile duct injury are more for pancreatitis, cholangitis or acute cholecystitis (4). In our case, it was performed for cholangitis, rendering a higher risk of injury.

There is a debate on effectiveness of operative cholangiography in prevention of biliary injuries. Fletcher et al. demonstrated that the use of operative cholangiography causes an overall two fold reduction of biliary injuries in routine cases and eight fold in complex cases (4). However, it must be noted that several cholangiograms are interpreted incorrectly and injuries are missed.

Recent series conducted on biliary injuries shows that only 6% - 33% of operative cholangiograms had correct interpretations (5). Since intraoperative cholangiogram is not performed in our centre as a routine practice, therefore it was not done for our patient.

Injuries are best identified at the time of surgery. An unrecognised injury may present early or late among patients following surgery. Early presentations are with postoperative biliary fistula, biliary peritonitis or jaundice (6). Our patient has clinical features of worsening jaundice and localised abdominal tenderness suggesting biliary peritonitis without overwhelming sepsis. Late presentations are accompanied by slow onset of jaundice due to stricture formation from a partial injury, localised inflammation or ischaemic insult. Some patients may present with secondary infection of atrophied liver segments following ligation of sectoral

ducts. Injuries may present with secondary biliary cirrhosis and its occurrence is quite rare (6).

It is important to mention that if patient has on-going abdominal pain, vomiting, fever or bile in an abdominal drain and does not meet the criteria of discharge after 24 hours, he or she must be considered to have a biliary leak (7). Our patient was documented to be discharged on day 3 postoperatively from the referral note; however no reasons were documented for the delay of discharge. Following suspected biliary leak, ultrasound was considered initial investigation and can provide information about presence of intraabdominal or pelvic fluid, biliary dilatation or retained stones within the bile duct (8). Ultrasound findings in our case showed gross ascites but no biliary tree dilatation nor residual stones. The majority of the cases of biliary fistulas are caused by leaking from the subvesicle ducts or cystic duct stump. Endoscopic retrograde cholangiopancreatography supports for anatomical endoscopic sphincterotomy, definition or stent placement (9). However, cholangiography during ERCP in our patient was unsuccessful as bile duct was occluded by clips.

Though percutaneous transhepatic cholangiography (PTC) is not frequently implied for the diagnosis or delineation of biliary anatomy but may assist biliary decompression. Control of biliary fistula with external drainage is necessary where diagnosis of bile duct injury has been delayed (6). Since our patient was detected within the first week of injury in a stable and non-septic condition, surgical repair was offered.

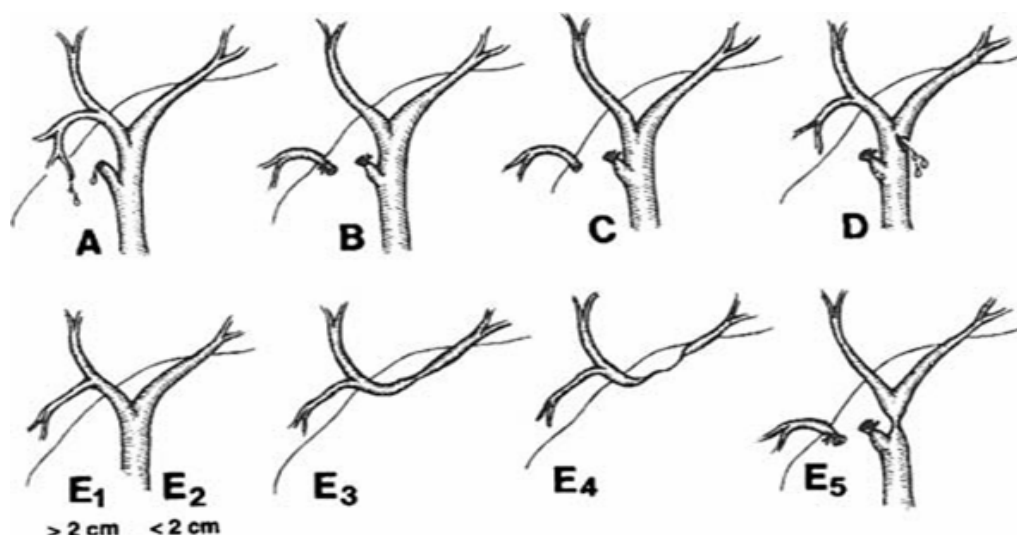
There are different classification systems for biliary tree injury with Bismuth and Strasberg being the commonly used. Bismuth classification describes biliary strictures and reflects the relationship between injury and biliary confluence (10). Strasberg classification is broader in context as it has several biliary intricacies such as partial injuries to the biliary tree, biliary and cystic stump leaks (10).

Table 1: Bismuth Classification of Biliary Tree Injury (11)

BISMUTH CLASSIFICATION	DEFINITION
Bismuth 1	Low common hepatic duct stricture - hepatic duct stump > 2cm
Bismuth 2	Proximal common hepatic duct stricture - hepatic duct stump <2cm
Bismuth 3	Hilar stricture with no residual common hepatic duct – hepatic duct confluence intact
Bismuth 4	Destruction of hepatic duct confluence – right and left hepatic ducts separated
Bismuth 5	Involvement of aberrant right sectoral hepatic duct alone or with concomitant stricture of common hepatic duct

Table 2: Strasberg Criteria of bile duct injury (10)

TYPE	CRITERIA
A	Cystic duct leaks or leaks from small duct in the liver bed
B	Occlusion of the part of a biliary tree, almost invariably the aberrant right hepatic duct
C	Transection without ligation of the aberrant right hepatic duct
D	Lateral injuries to major bile duct
E1	Low CHD stricture, with a length of the common hepatic duct stump of > 2 cm
E2	Proximal CHD stricture-hepatic duct stump < 2 cm
E3	Hilar stricture, no residual CHD, but the hepatic ductal confluence is preserved
E4	Hilar stricture, with involvement of confluence and loss of communication between right and left hepatic duct
E5	Involvement of aberrant right sectorial hepatic duct alone or with concomitant stricture of the CHD

**Figure 1:** Strasberg Classification of Biliary Tree Injury (10)

In our patient, there were 2 clips across the distal common hepatic duct with stump more than 2 cm, thus making it classified as Bismuth I or Strasberg E1. There are a few principles in the biliary reconstruction (12). First and foremost, biliary reconstruction should be performed under ideal conditions at the time of injury or immediately after the injury. In late presentations, repair should only be considered when the patient has been optimised, absence of intra-abdominal sepsis and sufficient time given to allow maturation of adhesions and tissues at porta hepatis. Since the blood supply to bile duct is usually damaged at the time of injury, therefore maximum proximal opening of common hepatic duct should be carried out. Extension of the incision into the left hepatic duct allows a wide anastomosis to be fashioned with adequate views of right and left hepatic ducts. For injuries with separation of the confluence, the right and left hepatic ducts can be anastomosed together before formation of hepaticojejunostomy, allowing a

single biliary anastomosis. Repair should be affected by a hepaticojejunostomy with a 70 cm Roux limb of jejunum to minimise the risk of chronic damage and enteric reflux to biliary tree. Fine absorbable interrupted sutures of 4/0 or 5/0 polydioxanone sulphate (PDS II) should be used to fashion an end to side hepaticojejunostomy, with care to produce good mucosal apposition (1).

Successful repair of injury has been well described and can be achieved in 90% patients in a specialised unit. Anastomotic strictures, liver atrophy and cirrhosis may occur many years after surgery. However, the predictors of a poor outcome include involvement of biliary confluence, surgeons mishandling and three or more previous attempted repairs and recent active inflammation (13). Our patient had a successful repair and recovery with satisfactory prognosis.

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