



Surgical Management of Post Cholecystectomy Biliary Injuries: A Center Experience.

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ABSTRACT

Background: Bile duct injury (BDI) is the nightmare sequelae following gallbladder surgery. Ranging from 0.3 to 1.5%. **Methods:** A retrospective study was done from October 2010 to October 2020; including 162 patients who suffered from biliary complications post-open and laparoscopic cholecystectomy. All the patients were managed surgically and followed up for at least 2 years in the advanced hepatopancreatico-biliary center, at Zagazig University, Egypt.

Results: Most of our patients were females (69.75%) with median age (of 33±12.3) years. Biliary leakage was presented in 71 (43.83%) patients, ligated CHD presented in 59 (36.42%) patients, long-term biliary stricture was in 29 (17.9%) patients and haemobilia was in three patients. Roux-en-Y hepaticojejunostomy (HJ) was the procedure in all patients. No mortality was reported in our patients while post-operative complications were detected in 31 (19.13%) patients. Post-operative HJ stricture was 13/162 (8.02%) patients. Percutaneous Transhepatic Biliary Drainage (PTBD) was used successfully in managing anastomotic stricture in 11 patients.

Conclusions: Iatrogenic BDIs represent catastrophic sequelae post-cholecystectomy. Proper management requires early diagnosis, management of intra-abdominal fluid collection and infection, nutritional support, a multi-disciplinary team, and an expert hepato-biliary surgeon.

Keywords: Bile Duct Injury; Cholecystectomy; Biliary Leak; Hepatico-jejunostomy; Anastomotic Stricture.



INTRODUCTION

The incidence of bile duct injury (BDI) after laparoscopy beginning was 1–1.5% [1]. But nowadays it decreases to 0.08 and 0.3% [2,3]. Meanwhile, minor BDI ranges from 0.3 to 1.5% [4,5]. The main cause of BDI is the misconstruction of biliary anatomy in 71%–97% of all cases [1]. Other causes also present like human faults, unnecessary dissection in Calot's triangle, acute cholecystectomy with disturbed anatomy unnecessary use of diathermy close to bile ducts, and wrong traction on the gallbladder [6].

Post-cholecystectomy complications vary a lot such as strictures, recurrent cholangitis, biliary cirrhosis, and biliary leakages [7]. These complications necessitate prolonged hospitalization and carry high morbidity and mortality rates [8]. Strasberg classification with

Bismuth modification classifications were the most used scorings in BDI [9,10].

Early diagnosis of iatrogenic BDI is mandatory to avoid major morbidities. ultrasound and Computerized Tomography (CT) were routine radiological investigations used. Magnetic Resonance Cholangiopancreatography (MRCP) is nowadays the standard investigation that used to be non-invasive. While using ERCP has the advantage of being therapeutic and diagnostic [11].

Management plan differs from one center to other regarding when to interfere. Keeping in mind to decrease the morbidity severity, improve the patient's general condition, and admission the patient to specialized centers [12]. Proper management requires a multidisciplinary team (hepato-biliary surgeons, gastroenterologists, and interventional

radiologists) to reach the most suitable option for the patient [13].

Time management of BDI is still a controversial issue. Many surgeons do repair as seen via expert hepatobiliary surgeons. Because the rate of identification of BDI intraoperative is high ranging from 15–80% depending on the analyzed series [14]. Unfortunately, these patients usually present later with a bile leak, jaundice, cholangitis, and sepsis [15]. So, there is another opinion in choosing the time of repair which is delaying the definitive surgery until the subsidence of the inflammation [16].

METHODS

Patients and study design

Written informed consent was obtained from all participants, the study was approved by the research ethics committee of the Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

A retrospective study from October 2010 to October 2020 involved 162 patients who suffered from post-cholecystectomy BDI (open and laparoscopic). All patients were followed for at least 2 years in the advanced hepatopancreatico-biliary center, at Zagazig University, Egypt. We excluded patients with minor injuries and biliary stricture that was managed with Endoscopic retrograde cholangiopancreatography (ERCP).

The time of our patient's presentation differed, some of them presented intra-operatively during laparoscopic cholecystectomy (bile leak). But most of them presented during the 1st two weeks with a biliary leak in the form of external biliary fistula through abdominal drains or by biliary peritonitis (which drained by percutaneous drainage, laparoscopic drainage, laparotomy drainage, or biloma needed percutaneous pigtail insertion).

Others presented in the interval period between 2 and 6 weeks with obstructive jaundice alone or jaundice associated with cholangitis (abdominal pain, fever, chills). While those with long-term biliary stricture presented with delayed jaundice and cholangitis. Only three patients presented after 3-months with hematemesis and obstructive jaundice due to haemobilia.

Laboratory investigations used were (liver and kidney function tests, CBC, and coagulation profile). While radiological investigations used were in the form of abdominal ultrasound, computed tomography (CT), and magnetic resonance cholangiopancreatography (MRCP). MRCP was the gold standard investigation to evaluate the biliary anatomy and biliary tract problems. Sometimes ERCP is used in an attempt to manage the bile leaks, but we exclude these patients from our study with successful ERCP stent drainage (Figure 1).

Surgical management

All patients received preoperative prophylactic antibiotics to control infection, vitamin K, fresh frozen plasma, and human albumin to correct coagulopathy and hypoalbuminemia due to long-standing jaundice and cholangitis.

Steps

Right subcostal incision. Meticulous adhesions dissection. Meticulous dissection of the porta hepatis to find the site of bile duct injury. Intra-operative cholangiogram to delineate the biliary tree anatomy. Intestinal loop preparation for the anastomosis. Entero-enterostomy side to side. Hilar Roux-en-Y hepaticojejunostomy (HJ) to avoid ischemia and to obtain good bile flow. Interrupted stitches using Prolene 6/0 or 5/0 (parachute technique). Epidural catheter inserted as a biliary stent, to be removed after 3 months after stent cholangiogram. Sometimes we do liver resection after persistent biliary stricture leading to multiple liver biliary abscesses. Intra-abdominal drain (Figure 2).

Statistical analysis

it was performed using SPSS 22.0 statistical software package. Continuous data were expressed as the mean \pm standard deviation (SD), and the t-test was used to compare the continuous variables. The difference was statistically significant at $P < 0.05$.

RESULTS

Most of our patients were female (69.75%) with median age (of 33 ± 12.3) years and a median BMI of 29.3 kg/m^2 . Fifty-six (34.57%) patients had co-morbidities in the form of diabetes, hypertension, cardiac problems, and morbid obesity, but most of our patients were ASA I, II. More than 70% of BDI occurred post-laparoscopic cholecystectomy (Table 1).

Biliary leakage presentation due to side wall

injury or complete transection of the biliary tree was in 71 (43.83%) patients. Fifteen patients of them were presented intra-operative during laparoscopic cholecystectomy while fifty-six of them presented postoperatively. Biliary peritonitis was found in 31 patients, percutaneous drainage with pigtail was done in 9 patients, laparoscopic drainage was done in 14 patients and laparotomy drainage in 8 patients. Obstructive jaundice due to ligation of the biliary tree by clips or sutures was found in 59 (36.42%) patients.

Long-term complications occurred in 32 (19.75%) patients, in the form of biliary stricture in 29 (17.9%) patients that had obstructive jaundice and cholangitis. While three patients presented with hematemesis and obstructive jaundice due to haemobilia. Haemobilia is mainly caused by using diathermy cautery near the CHD forming fistula between the anterior right hepatic artery and CHD.

Table 1 shows demographic data with post-cholecystectomy biliary complications of the patients.

According to the Strasberg-Bismuth classification, BDI in our study included type D in 4 patients that were repaired with biliary stent intra-operative and type E in the rest of our patients. Most of our patients (34.59%) presented as type E2. All of these patients underwent biliary reconstruction by Roux-en-Y HJ. The intra-operative repair was done in 15 (9.43%) patients, early repair in 17 (10.69%), intermediate repair in 31 (19.5%) patients and

delayed repair in 67 (42.14%) patients. Twenty-nine Patients with biliary stricture underwent repair after 3 months. Liver resection was needed in three patients of them due to multiple biliary abscesses; two underwent left hepatectomy while one needed right hepatectomy. Three female patients with haemobilia were detected 3 months post laparoscopic cholecystectomy, and the fistula was detected between the right anterior hepatic artery and right duct. Intervention radiology with the closure of the fistula with coil followed by ERCP (stenting and sphincterotomy) done in two patients. While the surgical repair was done for one patient.

No mortality was reported in our patients while post-operative complications were detected in 31 (19.13%) patients, six patients with wound infection were managed with drainage and antibiotics, two patients had sub-phrenic collections, and one patient had pelvic collection; all were managed with percutaneous pigtail insertion. Post-operative HJ stricture was detected in 13/162 (8.02%) patients; most of them were detected in the 1st year post-operative. 6/17 (35.29%) patients of them detected after early repair, 5/31 (16.13%) patients after immediate repair; while 2/67 (2.98%) patients of them detected after delayed repair. Eleven patients of them were managed with intervention radiology; nine patients were managed with balloon dilatation only, while two patients needed balloon dilatation and stenting

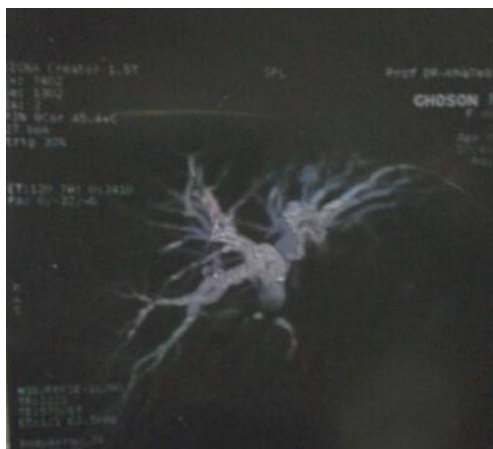


Figure 1: Diagnosis of BDI. **A.** MRCP post laparoscopic cholecystectomy ligated CHD. **B.** ERCP post-laparoscopic cholecystectomy biliary injury.

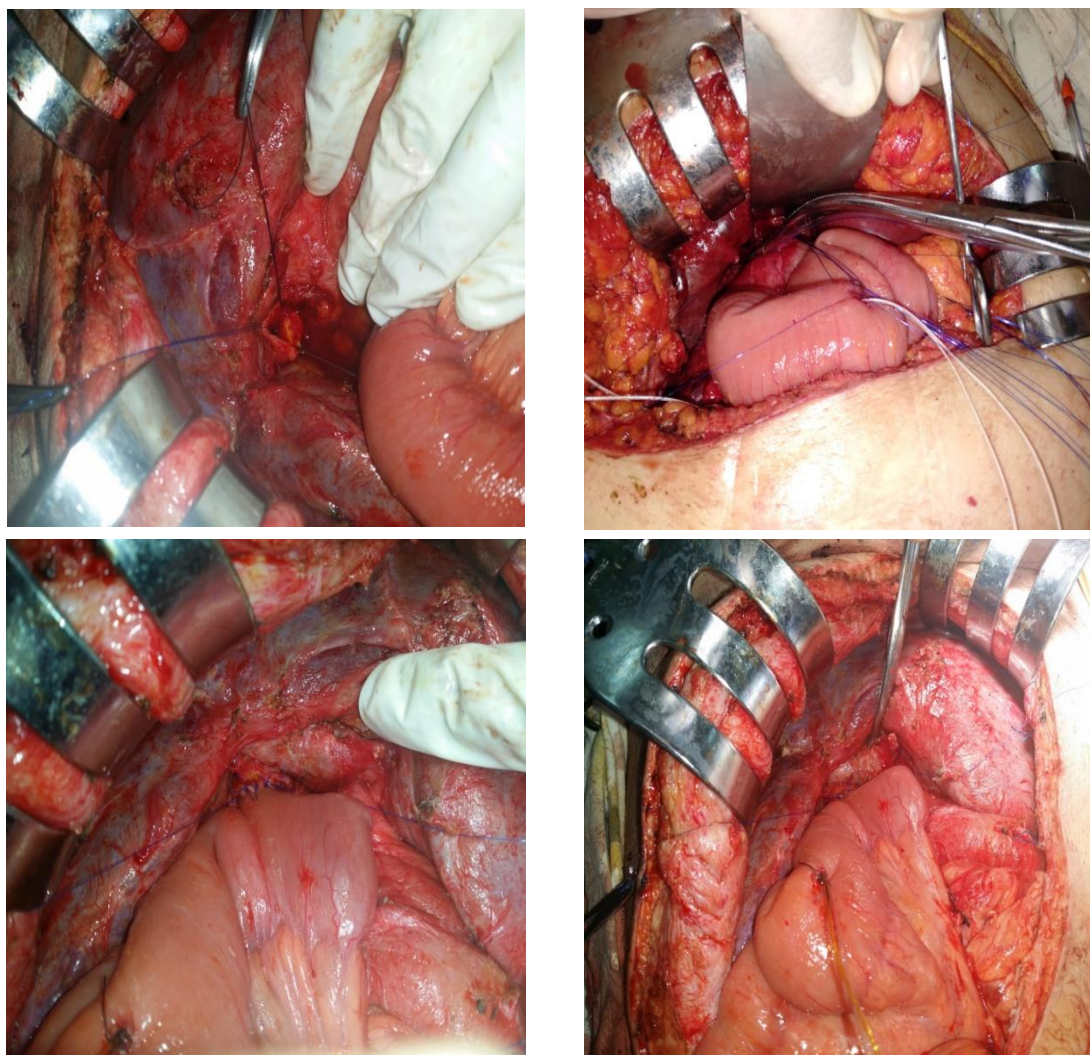


Figure 2: Intra-operative HJ. **A.** Intra-operative CHD preparation for anastomosis. **B.** Intraoperative interrupted stitches during HJ. **C.** Roux-En-Y HJ. **D.** Epidural stent as a biliary stent.

Table 1: Demographic data with post-cholecystectomy biliary complications.

Variables	Number of Patients (N=162)
Sex	
Female	113 (69.75%)
Male	49 (30.25%)
Age	25-62 (33±12.3) years
BMI	22-49.5 (29.3) kg/m ²
*Comorbidity	56/162 (34.57%)
Diabetes.	14/56 (25%)
Hypertension.	25/56 (44.64%)
Cardiac.	3/56 (5.3%)
BMI > 35.	41/56 (73.21%)
ASA	
I	70 (43.21%)
II	81 (50%)

Variables	Number of Patients (N=162)
III	11 (6.79%)
Presentation	
Biliary leakage.	71 (43.83%)
Biliary tree ligation.	59 (36.42%)
Biliary stricture.	29 (17.9%)
Haemobilia.	3 (1.85%)
**Symptoms	
Biliary leakage	
Intra-operative leak	15/71 (21.13%)
External biliary fistula	16/71 (22.5%)
Biliary peritonitis	31/71 (43.67%)
Biloma	9/71 (12.68%)
Jaundice and cholangitis	20/71 (28.17%)
Ligated biliary tree	
Obstructive Jaundice	22/59 (37.29%)
Jaundice and Cholangitis	37/59 (62.71%)
External biliary fistula	21/59 (35.59%)
Biliary Stricture	
Jaundice and cholangitis	29/29 (100%)
Haemobilia	
Hematemesis and jaundice	3/3 (100%)
<u>Type of cholecystectomy:</u>	
Post-open cholecystectomy.	47/162 (29.01%)
Post laparoscopic cholecystectomy.	115/162 (70.99%)

*one patient presented with more than one comorbidity.

**One patient presented with more than one symptom.

DISCUSSION

BDI represents a horrible problem, so prevention is easy than its management. Besides that, the result of its management is difficult and sometimes accompanied by unsatisfactory outcomes. Even with experienced hepato-biliary surgeons, the challenge is great [17]. The incidence of BDI post open cholecystectomy ranges from 0.2 and 0.5%, while double this percentage occurs following laparoscopic cholecystectomy [18].

In our study, only 15 patients (9.26%) were diagnosed intra-operatively. While Agabiti, et al. [18] reported that one-third of BDI was discovered intraoperatively in their study out of 200 patients following open or laparoscopic cholecystectomy.

Abdominal ultrasound is usually used to detect collections, CBD dilatations, and associated vascular injuries [6]. CT scan has the advantage of detecting the presence of ascites, biliary obstruction, collections, or long-term problems following long-standing stricture. MRCP is

considered the cornerstone in the diagnosis of biliary tree abnormalities [19,20]. In our study, abdominal ultrasound was done routinely for the detection of biloma, biliary collection, or intrahepatic biliary dilatation in obstructive jaundice patients. All patients in our study underwent MRCP as a routine investigation for delineation of the biliary tree.

Another dilemma is the time of management, which is still controversial. However, delay of repair has the least post-operative problems compared to early repair [21,22]. Explanation of delayed repair may be attributed to the poor control of the general condition, and infection control. It allows the surgeon to anastomose at a higher-level following bile duct ischemia final level [23].

Iannelli A, et al. [21], discussed repair timing. The immediate repair was done in 194 patients (35.7%), the early repair was done in 216 patients (39.8%) and late repair was done in 133 patients (24.5%). Morbidity was less in delayed repair (14.3%) compared with immediate and

early repair (39.2% and 28.7%, respectively). Also, mortality was higher in the immediate and early repair groups (2.8% and 2.2%, respectively) in comparison with delayed repair (0.8%). This cope with our results where we found biliary stricture after early repair (less than 6 weeks interval) was in (11/48) 22.92% of patients compared with (2/67) 2.98% in late repair.

The Roux-en-Y HJ is the gold-slandered technique used for BDI repair. Being in mind that anastomosis should be as high level as possible to prevent leakage and stricture due to ischemia [23-25]. In our study, we used 60-60cm Roux-en-Y HJ end-to-side anastomosis and interrupted sutures with a biliary stent.

There was no mortality in our patients while the post-operative complications were detected in 31 (19.13%) patients including wound infection, sub-phrenic and pelvic collections, and long-term complications such as HJ stricture and incisional hernia. Our results are comparable with Fischer et al. [26] study results in which morbidity was reported in 39% of the patients. In the form of wound infections, chest infections, subphrenic collections, biliary leaks, and incisional hernia.

Anastomotic strictures following reconstructions range from 4.1 and 69%, with an average rate between 10– 20%. Causes of strictures may be due to operation time, inexperienced surgeons, associated vascular injury, injury level, and tissue damage following injury [27].

Usually, stricture develops between 11- and 30 months post-reconstruction. This necessitates a long follow-up period following HJ for BDI. In our study, the patients were followed up for 2 years with the assessment of cholestatic parameters every 3 months. The incidence of post-operative HJ stricture was 13/162 (8.02%) patients; most of them occurred in the 1st year post-operative.

CONCLUSIONS

Prevention of iatrogenic BDIs should be the first thought in every surgeon's mind during cholecystectomy. Keep in mind that endoscopic, radiologic, or surgical management carries acceptable outcomes in around 90% of patients, but with disturbing quality of life.

Golden rules in the management include early diagnosis, general condition improvement,

collection and infection control, nutritional support, multidisciplinary team, and experienced hepato-biliary surgeon in specialized centers.

Roux-en-Y HJ is considered the standard way of management, with an incidence of stricture in 10–20% of patients. Long-term follow-up reaching 2 years is mandatory.

Conflict of interest

The authors report no conflicts of interest. The authors are responsible for the content and writing of the paper.

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