Management of postcholecystectomy biliary injury in Assiut University Hospital clinical audit

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Introduction
Laparoscopic cholecystectomy, first introduced in France in 1987, has rapidly substituted open cholecystectomy for the treatment of symptomatic cholelithiasis. Bile duct injuries have remained an important complication and have become more frequent in the era of laparoscopic cholecystectomy.

Aim
The aim was to compare the management of post-cholecystectomy biliary leakage in patients in Assiut University Hospital with management guidelines through planning for improving our management of biliary leakage, correction of obstacles to achieve less morbidity and less mortality which result from biliary leakage.

Patients and methods
An observational study was conducted on 30 patients with post-cholecystectomy biliary injuries admitted in the Surgery Department of Assiut University Hospitals from 2017 to 2018. All patients were grouped into either surgical or endoscopic, percutaneous drainage managed groups.

Results
The most common presentation postoperatively is bile leakage in 14 of the patients (46.66%), followed by jaundice in six patients (20%), and abdominal pain in four patients (13.3%); only two patients discovered during operation has bile duct injury (6.66%) and in the postoperative period in the first month (86.6%). The most common type of bile duct injury occur in open cholecystectomy (73.33) more than in laparoscopic (26.66). Cholangiogram was done in 25 patients. The main cholangiographic picture was minor leakage in about 52% from Cystic duct (CD), stricture above the level of CD in 8%, and common bile duct (CBD) ligation injury in 40%.

Conclusion
In conclusion the most common type of post-cholecystectomy problems are biliary leakage, followed by ligation of CBD, missed CBDSs, and finally biliary stricture. Endoscopic management is relatively simple, reversible, and minimally invasive. Thus, endoscopic management should be an integral part of the therapeutic algorithm in majority of patients with significant biliary tract injuries.

Keywords:
bile duct injury, common bile duct, laparoscopic cholecystectomy, open cholecystectomy

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Introduction

Laparoscopic cholecystectomy (LC), first introduced in France in 1987, has rapidly substituted open cholecystectomy (OC) for the treatment of symptomatic cholelithiasis. In the United States, the number of laparoscopically performed cholecystectomies has rapidly grown over the last 15 years, and more than 800 000 LC are performed in the USA annually [1].

Bile duct injuries have remained an important complication and have become more frequent in the era of LC. The majority of this increase was attributed to acquiring new technical skills to perform LC [2].

The incidence of bile duct injury (BDI) with LC is approximately twice as high as that following OC. Bile leaks comprise the most common type of BDI and commonly arise from the CD stump or accessory ducts of Luschka; however, major duct injuries, including biliary strictures, fistulas, and complete or partial bile duct transaction are also encountered [3].

Despite some reports of a trend in decreased incidence, the rate of LC-associated BDI seems essentially unchanged in more than a decade since its introduction. Measures that may have a plausible impact on the rate of biliary complications have not proven beneficial [4].

Aim

The aim was to compare the management of post-cholecystectomy biliary leakage in Assiut University

Hospital with management guidelines through planning for improving our management of biliary leakage, correction of obstacles to achieve less morbidity and less mortality which result from biliary leakage.

Patients and methods

An observational study was conducted on patients with post-cholecystectomy biliary injuries admitted in the Surgery Department of Assiut University Hospitals from 2017 to 2018.

All patients were grouped into either surgical or endoscopic, percutaneous drainage managed groups. On the basis of the definite treatment at the Assiut University Hospital, patients signed an informed consent. The study was approved and monitored by the Medical Ethics Committee Assiut Faculty of Medicine IRB#17100953.

Inclusion criteria

Patients who had post-cholecystectomy problems (IBD) during open and LC.

Exclusion criteria

Patients who had traumatic biliary injury or injury during some procedures other than cholecystectomy.

Statistical analysis

SPSS windows (SPSS Inc., Released 2007, SPSS for Windows, Version 16.0. Chicago, SPSS Inc.) software was used for the analysis of our data as follows: Description of quantitative variables in the form of mean standard deviation, range, and percentage. The statistical differences were estimated by mean difference and paired *t*-test. χ^2 with a *P* value of less than 0.05 was considered significant.

Results

Clinical presentation

The most common presentation postoperatively is bile leakage in 14 of the patients (46.66%), followed by jaundice in six of the patients (20%) and abdominal pain in four patients (13.3%) as shown Table 1.

Abdominal ultrasound

Ultrasound (US) finding in post-cholecystectomy problems showed no specific finding in (30%), free fluid collection in 26.6%, dilated common bile duct (CBD) and intrahepatic biliary radicles (IHBR) in 23.33%, more details are seen in Table 2; there is no specific finding in five patients.

Endoscopic cholangiogram

Cholangiogram was done in 25 of the patients. The main cholangiographic picture was minor leakage in about 52% from CD, stricture above the level of CD in 8%, and CBD ligation injury in 40% as shown in Table 3.

Surgical treatment

Biliary reconstruction was done in 13 of patients, including intraoperative repair in two patients; one case was treated urgently by peritoneal lavage. Planned surgical approach was done in 10 cases. In eight cases reconstruction was by Roux-en-Y hepaticojejunostomy; two cases were with right hepatectomy + hepaticojejunostomy as presented in Table 4.

Discussion

The management of bile injuries is difficult, and satisfactory results are not always obtained. The management of these problems provides an enormous challenge, even to experienced biliary surgeons [5].

Table 1 Clinical presentations of post-cholecystectomy problems

Clinical presentation	*n* (%)
Bile leakage	14 (46.66)
Obstructive jaundice	6 (20)
Biloma	3 (10)
Abdominal pain	4 (13.3)
Sepsis	3 (10)

Table 2 Ultrasound finding

US finding	*n* (%)
Dilated CBD and IHBR	7 (23.33)
Free fluid collection	8 (26.66)
Combined picture	5 (16.66)
Localized intraperitoneal bile collection (biloma)	1 (3.33)
No specific finding	9 (30)

CBD, common bile duct; US, ultrasound.

Table 3 Cholangiogram finding

Cholangiogram finding	*n* (%)
Cystic duct leakage (minor)	13 (52)
CBD leakage (*n*=6) or ligation (*n*=4)	10 (40)
Stricture segments above the level of cystic duct	2 (8)
Normal	0
Total	25 (100)

CBD, common bile duct.

Table 4 Surgical treatment of post-cholecystectomy problems

Surgical intervention	*n* (%)
Hepaticojejunostomy	8 (61.54)
Intraopertive reconstruction with T-tube	1 (7.69)
Intraoperative reconstruction on stent	1 (7.69)
Peritoneal lavage and intra-abdominal drains	1 (7.69)
Hepatectomy with hepaticojejunostomy	2 (15.38)

Incidence

The BDI rose from 0.1–0.2% to 0.4–0.7% from the era of OC to the era of LC [6].

According to the incidence of BDI among open and LC, our result showed higher incidence after conventional OC more than LC. In contrast to the generally accepted higher incidence after LC more than OC, usually laparoscopic IBD tends to be more severe and high proximally and this may be attributed to the low incidence and affinity for laparoscopic procedures in the Upper Egypt locality as reported in Redwan [7].

Clinical picture

The most common presentation postoperatively is bile leakage in 14 of the patients (46.66%), followed by jaundice in six patients (20%), and abdominal pain in four patients (13.3%). The four cases presented by mild abdominal colic, two cases show leakage from the cystic duct; the other two show leakage from the accessory duct causing biloma (10%) and sepsis (10%). Chaudhary [8] found that manifestations of post-cholecystectomy BDI included bile leak in 65% of patients, jaundice in 27%, and excessive postoperative pain in 8%. Another study by Redwan [7] showed that the early symptoms of BDI were leakage (18%), abnormal cholangiogram (11%), jaundice (11%), and jaundice and leakage (3%), bile fistula (1%), and colic and infection in 2.4%. Late presentations and their incidence showed that jaundice was the main clinical presentation (37.1%), colic (11.5%), cholangitis (3%), and fistula (3%).

In contrast the Dowdier [9] study found that the most common presentation was jaundice which was present in 46.5% patients, followed by biliary leakage in 15%, combined jaundice and leakage in 28.1% and sepsis in 3.1%, and failed primary repair in 6.3%.

Diagnostic workup

Diagnostic workup and treatment of bile duct injuries need a multidisciplinary approach requiring gastroenterologists, radiologists, and surgeons Nitin *et al.* [10].

Abdominal ultrasound

Radiological imaging is extremely useful and is the preferred way to evaluate for the presence of BDI. US is the key of the investigation that is capable to detect intra-abdominal fluid collections and ductal dilations. Small fluid collections in the gallbladder (GB) fossa are found in some patients after cholecystectomy, and are usually irrelevant. However, large fluid collections outside the GB fossa are of concern for BDI [11].

US done as a routine primary investigation in our study revealed fluid collection at the GB bed in 3.33%, dilated CBD and IHBR in 26.6, and free intraperitoneal collection in 60% with no finding in 10%. Another study by Dowdier [9] showed that US showed biliary dilatation in 59% of patients while abdominal collections were detected in 41%.

Endoscopic cholangiogram

Preoperative cholangiographic delineation of the biliary anatomy is mandatory for an accurate preoperative classification of BDIs and to plan the operative strategy [12].

In this study cholangiogram was done in 25 of the patients. The main cholangiographic picture was minor leakage in about 52% from CD, stricture above the level of CD in 8%, and CBD ligation injury in 40%. In comparison a study by Abdel-Raouf *et al.* [13] showed that the main cholangiographic picture was bile leakage in 64.2%, completely ligated CBD in 11.9%, biliary stricture in 12.7%, and normal cholangiogram in 11.2%. Another study by Redwan [7] found dilatation of biliary channels in 61%, major leakage in 9.1%, minor leakage in 8.6%, stricture (low CBD in 1.4%, mid-CBD in 2.4%, high CBD in 18.6%, and hepatic duct in14.8%), arrest of the dye (ligated CBD) in 9.1%, transection of CBD in 2%, and free cholangiogram in 3.3%.

Endoscopic management

Bile leakage: in this study, 19/25 (76%) patients of endoscopically managed patients had biliary leakage; 13 patients who had minor bile leaks were treated by endoscopic sphincterotomy only (13/19 = 68.4%). Endoscopically treated minor bile leaks have a success rate of 100%. Moderate leakage presented in four patients (21%) who were treated by sphincterotomy and stent and marked leakage in two patients (10.5%) which was also treated by sphincterotomy and stent. The endoscopic success rate was 78.9% as four cases with moderate and major leakage together failed. This was in comparison to a study by Hassanien [14], who reported that endoscopic sphincterotomy was done in four patients (12.9%), endoscopic stenting in

eight patients (25.8%), combined sphincterotomy and stenting in 14 patients (45.2%), and sphincterotomy and NBD in three patients (9.7%). In total, 29 out of 31 patients (93.5%) underwent successful endotherapy and were free of biliary symptoms, while Dolay *et al.* [15] treated low-grade leaks with sphincterotomy alone (90% success), and high-grade leaks with stenting with or without sphincterotomy (80% success). Recently the Wani *et al.* [16] study concluded that endoscopic sphincterotomy was done only in (73.8%) for minor leakage with a success rate of 100% endoscopic stenting in combined sphincterotomy in (26.2/%) for major leakage with a success rate of 100%. This difference in our success rate of major leakage can be explained by the fact that we had only two cases with post-cholecystectomy biliary leakage.

Biliary stricture: in this study, 6/25 (24%) of endoscopically managed patients had biliary stricture treated by serial endoscopic dilation and stenting and following endoscopic protocol over a period of 24 months with only one having recurrent stricture after removal of stent. The overall success rate was 76% while Grönroos *et al.* [17] followed up 44 patients after endoscopic stenting for 9 years, which reported a 20% recurrence rate that occurred within 2 years of stent removal.

Percutaneous transhepatic cholangiography

PTC performed in one patient showed biliary stricture at the confluence of right and left hepatic ducts (Bismuth type III).

Aduna *et al.* [12] reported that 10 out of 25 cases have IBDI: Bismuth type III was the most common type, followed by Bismuth type 2 and type 1.

PTC is an accepted tool for the planning of surgical reconstruction in patients with major bile duct injuries as it often correctly shows the location of the injury.

Surgical management

A total of 13/30 (43.3%) was treated surgically.

Intraoperative and immediate surgical repair: when a simple BDI is detected intraoperatively, immediate repair is advised [18].

In our study, two patients out of 13 patients surgically treated (15.4%) were discovered intraoperatively. One has partial injury of the anterior wall of CBD during the operative time; it was repaired primarily over T-Tube. The other one has right hepatic duct injury repair of tube was done. Compared with the study by Lum *et al.* [11], 200 cases were treated for postcholecystectomy biliary injuries showed that 30% of the lesions were discovered intraoperatively. These were managed intraoperatively by primary repair over tube.

Urgent surgical approach: in this study only one patient (7.7%) had biliary peritonitis and was treated by peritoneal lavage and intra-abdominal drains. Surgical repair was delayed for 6 weeks, to allow inflammation in the right upper quadrant to subside before definitive reconstruction. This facilitates a technically optimal repair and appears to be associated with decreased postoperative complications. In agreement with a study by Lamberts *et al.* [19] it was found that 5% of patients had biliary peritonitis and were treated by peritoneal lavage.

Planed surgical approach: at our institution, a BDI is repaired by creation of hepaticojejunostomy. The decision to perform one type of repair over the other is made at the time of surgery and depends on the length and caliber of the healthy common hepatic duct (CHD) remnant. In our study, 10/13 cases (77%) underwent the planned surgical approach. Eight cases by Roux-en-Y hepaticojejunostomy and two cases with right hepatectomy + hepaticojejunostomy were done. In a study by Sicklick *et al.* [18] from January 1990 to April 2003 (over 13 years), 200 patients were treated for a major BDI; a total of 175 patients underwent definitive biliary reconstruction, including 172 hepaticojejunostomy (98%).

In our study, the overall treatment-related complication rate was significantly higher in the surgical group (53.8 vs 20% in the endoscopic group (P = 0.05). In the endoscopic group, mortality rate was 0% compared with 4.8% of the surgical group (P = 0.05). Recurrent stenosis was evidenced in 2.5% patients of the endoscopic group and 9.5% in patients of the surgical group. Restenosis after endoscopic treatment developed before 10 months compared with the surgical approach (2 years; P = 0.05). A similar observation was made in a study by Giovanni and colleagues who reported that the endoscopic group mortality rate was 0% compared with 7.69% of the surgical group (P = 0.05). Recurrent stenosis was evidenced in one out of 25 (4%) patients of the endoscopic group and one out of 13 (7.79%) patients of the surgical group.

Conclusion

(1) In conclusion, the most common types of post-cholecystectomy problems are biliary leakage, followed by ligation of CBD, missed CBDSs, and finally biliary stricture.

(2) A multidisciplinary approach between the biliary endoscopist, surgeon, and the radiologist is required for managing patients in many phases for treatment of post-cholecystectomy problems.
(3) Endoscopic management is relatively simple, reversible, and minimally invasive. Thus, endoscopic management should be an integral part of the therapeutic algorithm in the majority of patients with significant biliary tract injuries. However, the success of endoscopic therapy depends on the type of injury. An attempt at endoscopic therapy does not preclude subsequent surgical intervention and endoscopic stenting should be seen as a possible definitive therapy and at least as a bridge to surgery.

Recommendations

This study showed the following findings and recommendations:

(1) Clipping or ligation of the cystic duct near Hartmann's pouch rather than near the CBD.
(2) Since bile duct injuries add significantly to the morbidity of the patient, early detection is mandatory to avoid as much complications as possible.
(3) The optimum time for surgical repair of BDI is immediately when the injury has occurred.
(4) ERCP was successfully performed as a definitive therapy and at the very least a bridge to surgery.
(5) Roux-en Y hepaticojejunostomy is the surgical procedure of choice for the treatment of post-cholecystectomy biliary strictures in the long run.
(6) There is a need for long-term follow-up of patients who undergo surgical reconstructive procedures.

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Conflicts of interest

There are no conflicts of interest.

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