Management of postlaparoscopic cholecystectomy bile leakage: in the presence of MRCP, when to send the patient to undergo ERCP?

Taher H. Elwan, Mokhtar A. Bahbah

Department of General Surgery, Faculty of Medicine, Benha University, Benha, Egypt

Correspondence to Taher H. Elwan, MD, Benha Faculty of Medicine, Benha University, Benha, 13511, Egypt. Tel: 0133227491-0133213511;
E-mail: drtaher2008@yahoo.com

Received: 8 January 2020
Accepted: 21 January 2020
Published: 27 April 2020

The Egyptian Journal of Surgery 2020, 39:483–488

Objective
The aim was to investigate cases of postlaparoscopic cholecystectomy (LC) bile leakage and aim to check if endoscopic retrograde cholangiopancreatography (ERCP) is mandatory for every patient or only for selected cases.
Patients and methods
The present study includes 35 patients who had a bile leak following LC and subjected to conservative (nonoperative) management and had a patent biliary tree and normal anatomy in the magnetic resonance cholangiopancreatography (MRCP) study. Patients were distributed into two groups. Group A included 20 patients who did not undergo an ERCP, while the second group included 15 patients who underwent an ERCP from the start. The efficacy and outcomes of both lines of management and the time needed to fistula closure were studied. Data were collected, recorded, and statistically analyzed.
The results
In group A, conservative management succeeded in 18/20 of patients, while the remaining two patients were sent to undergo ERCP due to a distressing bile leakage after a time of conservative management. In group B, the first ERCP failed to help in the cessation of bile leak in 2/15 patients (13%), so they underwent a second ERCP. The mean hospital stay was higher (but not significant) in the non-ERCP group, 5.19±4.72 vs 4.88±3.41 days in the ERCP group. The pain scores, fever, and many other morbidities were higher in the ERCP group.
Conclusion
In post-LC bile leak, ERCP is not mandatory for patients who have a patent biliary tree with normal anatomy in MRCP study. In these patients, ERCP is better to be avoided as an initial step and should be restricted to the resistant cases.

Keywords:
bile leak, conservative management, endoscopic retrograde cholangiopancreatography, laparoscopic cholecystectomy

Egyptian J Surgery 39:483–488

1110-1121

Introduction

Gallbladder surgery is considered as one of the most common surgical procedures performed all over the world by general surgeons [1]. Bile leakage is a well-documented uncommon complication after laparoscopic cholecystectomy (LC) and its causes are generally divided into minor and major biliary injuries [2]. The majority of bile leak arises from the stump of the cystic duct or the duct of Luschka; however, it can be due to an iatrogenic injury to the common bile duct (CBD) or hepatic duct [3]. Bile leak may give rise to a biliary fistula, subphrenic or subhepatic collection, and generalized or localized peritonitis [3].

Obviously, this can be accompanied with considerable morbidity or even mortality, especially if it is not diagnosed and managed at an early phase [3]. Up to the early 1990s, bile leaks were managed conservatively; if the leak did not stop, a laparotomy was frequently performed. However, with the improvement in percutaneous radiological drainage, endoscopic retrograde cholangiopancreatography (ERCP), and laparoscopic methods, bile leak could be managed in a minimally invasive way with a probable reduction in morbidity and mortality [1]. The objective of ERCP intervention is to eliminate the pressure gradient through the sphincter of Oddi, thus allowing better flow of bile to the duodenum and permitting the leak to stop [4].

Generally, ERCP is supposed to be safe and effective with an experienced hand. However, the frequency of post-ERCP complication differs broadly according to the disease and the condition of the patient [5]. In a prospective study that included 2347 cases from

different hospitals, 9.8% had complications following ERCP and the most common complications in this study were pancreatitis (5.4%) and hemorrhage (2%) [6]. The complication rate among 3178 patients following ERCP in a Chinese study was 7.9% [7]. In another study conducted in the United Kingdom that included 4561 patients, the reported rate of post-ERCP complication was 5% [8,9].

Due to the results of the previously mentioned studies, it is important to select the post-LC bile leakage patients who should undergo ERCP to avoid more morbidity or mortality in an already complicated case. Despite numerous studies that have been published on the topic in recent decades, the optimal time for endoscopic intervention is not well proven [3]. In this study, we are trying to answer the questions, which patient of the post-LC bile leak should undergo an ERCP? And when can we say the conservative management of bile leak failed and when we have to send the patient to ERCP for endoscopic therapy?

Patients and methods

The present study was conducted in the General Surgery Department, at Benha University Hospital, Egypt and King Fahd Hospital, Saudi Arabia from December 2015 to December 2018, after approval of the study protocol by the Ethics Committee and obtaining a written fully informed consent. Our study included a total number of 35 patients (19 being referred from other hospitals) who were suffering from bile leakage following LC and treated conservatively and had a patent biliary tree and normal anatomy in magnetic resonance cholangiopancreatography (MRCP) study. Patients were divided into two groups: group A contained 20 patients which were randomly allocated, and were managed conservatively without the need for ERCP while group B contained the remaining 15 patients, who were randomly allocated and underwent an ERCP for management of post-LC bile leak.

All the patients in the study were examined clinically for demographic and constitutional data. Data collected includes a detailed medical history as well as general and local abdominal examination. Blood samples were extracted for complete blood count, liver enzymes, serum bilirubin (total, conjugated, and unconjugated), alkaline phosphatase, γ-glutamyl transferase, and kidney function tests. Radiological investigations were done for every patient in the form of abdominal ultrasonography (US) and MRCP. In addition, abdominal scanning by the computed tomography (CT) with contrast was implemented in some cases.

Inclusion criteria for the present study include patients who were diagnosed as having post-LC bile leak, age greater than or equal to 18 years and less than or equal to 70 years, and the patient's ability to undergo the study process and to sign a consent. In this study, we exclude all patients who underwent MRCP and/or US that revealed a major duct injury, transection, obstruction, or CBD stones, patient involvement in another study, and patients who have a prominent psychiatric disease.

Patients, management plan

Once the post-LC bile leak was suspected either through bile that came in the abdominal drain or the patient who came to the ER and suffering in the PO period. All patients underwent routine laboratory investigations as well as abdominal US/CT, followed by MRCP. If there was no drain, the sizeable apparent localized collection was drained percutaneously under US guidance and a catheter was kept in place to drain the bile.

Group A

In these patients, MRCP had excluded any CBD missed stone, major duct injury, stricture/occlusion or transection. Then the patients were admitted to the hospital under observation on a fat-free diet, daily laboratory investigations, and correction of any electrolyte disturbances. Once the biliary drainage stopped, an abdominal US was done to exclude any remaining collection (maybe due to drain occlusion). If free on US, the drain was removed and the patient discharged home.

Group B

When MRCP was performed and excluded any major duct injury or transection, ERCP was done at once in all cases of this group to outline the anatomy of the biliary tree, confirm the pathology, and for an appropriate therapeutic intervention. After confirmation of the leaking site, sphincterotomy was done and a stent (usually of a 10 F size and 7–12 cm in length) was inserted. Then the patients were admitted in the hospital under observation; they were put on fasting for 24 h, then on a fat-free diet, daily laboratory investigations, and correction of any electrolyte disturbances. As long as the leakage stopped which were confirmed by clinical and radiological tools, the drain was removed and the patients were discharged. Another ERCP was done 6–8 weeks after discharge to

confirm healing of the leaking site and to remove the biliary stent.

One patient from group A, presented in septic condition 10 days post-LC and was admitted in the ICU, then he underwent laparoscopy. A thorough washout/drainage was performed without any biliary intervention because of the patient's critical condition. The patient's condition improved postoperatively and the drainage decreased gradually over 5 days and the drain removed on the PO day 7. The same scenario happened with one patient in group B; however, the laparoscope was not available at that time and the patient underwent laparotomy for lavage and drainage only. Post-laparotomy, biliary drainage was high (600 ml/24 h) and increased with time up to 1100. Consequently, the patient underwent ERCP on the third PO day for sphincterotomy plus stent insertion; the drainage declined gradually over 6 days and the drain removed on day 7.

In group A, the failure of management was considered if the biliary leakage continued for 15 postoperative days or 15 days after drain insertion under US guidance, or bile leak for more than 1000 ml in 2 successive days. At this time, the patients were sent for ERCP. On the other hand, in group B failure of management was considered if the biliary leakage continued for 15 days after ERCP or bile leak of more than 1000 in 2 successive days. At this time, the patients were undergoing another ERCP for change or insertion of a stent.

Statistical analysis

The data presented as mean±SD, numbers, ranges, and ratios. The results were analyzed by means of Wilcoxon's ranked test. Statistical analysis was fulfilled through SPSS version 21 (IBM Corp., Armonk, New York, USA) for Windows Statistical Package. The *P* value was considered statistically significant if less than 0.05.

Results

The study included a total of 35 consecutive patients with bile leak [The amount of bile leak/day in group A was 260+125 (50–710) and in group B was 205+110 (40–560)] following LC for symptomatic gallbladder disease. Nineteen cases of these were referred postoperatively from other hospitals. Twenty (57%) individuals (group A) were managed conservatively without any endoscopic intervention (no ERCP), while for the remaining 15 (43%) cases (group B), ERCP was done once the bile leak was suspected.

Patient's demographic data and indications, as well as data of LC operations, are summarized in Table 1 and Fig. 1. During LC, intraoperative cholangiography was not routinely performed in all surgeries. Two procedures required conversion from LC to open in the non-ERCP group; there were dense adhesions in the gallbladder area in one patient and in the other case the anatomy was vague. In group B, two surgeries required conversion to open as well; the cause of conversion was an inflammatory phlegmon around the gallbladder in one patient and bleeding in the other case (Table 1).

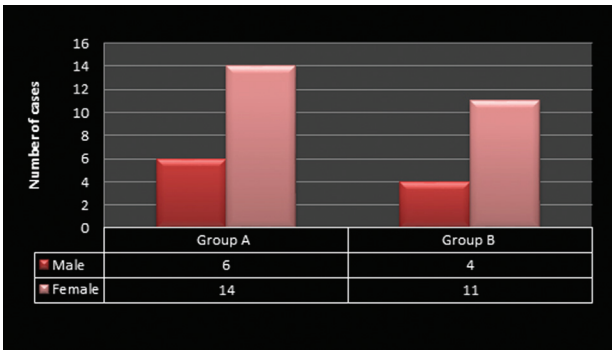
A drain was kept in the gallbladder fossa postoperatively in 14/20 (70%) and 10/15 (66.6%) of patients in groups A and B, respectively. The bile leaks most frequently presented as bile in this drain in the first postoperative (PO) day (12/20 in group A

Table 1 Patients' demographic data with indications for LC and postoperative details

Patients' data	Strata	Group A	Group B	*P* value
n (%)		20 (57)	15 (43)	
Age (years)		36.32±7.11 (24–62)	35.71±5.42 (22–66)	NS
BMI		27.3±2.45 (23–34)	28.5±2.55 (24–33)	NS
Indications for LC	Chronic cholecystitis	7 (35)	6 (40%)	NS
	Acute cholecystitis	5 (25)	4 (27)	NS
	Empyema of the GB	3 (15)	2 (13)	NS
History of pancreatitis	2 (10)	1 (7)	NS	
History of obstructive jaundice	3 (15)	2 (13)	NS	
Nature of LC	Elective	12 (60)	9 (60)	NS
	Emergency	8 (40)	6 (40)	NS
On table cholangiography	3 (15)	3 (20)	NS	
Conversion to open surgery	2 (10)	2 (14)	NS	
Insertion of drain intraoperatively	14 (70)	10 (66.6)	NS	
Time between LC and bile leak detection	4.9+5.2 (1–18)	5.4+2.3 (1–20)	NS	

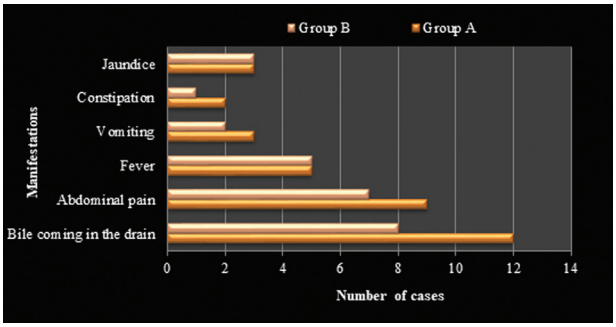
Data are presented as mean±SD and numbers; ranges and percentages are in parentheses. GB, gallbladder; LC, laparoscopic cholecystectomy.

Figure 1



Sex distribution of patients in our study.

Figure 2



Distribution of post-LC presenting manifestations (some cases may had more than one presenting symptom).

and 8/15 in group B). However, the first sign of a bile leak was biliary peritonitis in 1/20 patients of group A and 1/15 individuals in group B. Both of them had their drain removed on the PO day 1 as there had been insignificant draining and later developed peritonitis by the next 2 weeks. In the remaining patients, there was no drain left and they presented postoperatively with a biloma in the first 2 weeks after LC. The distribution of the post-LC presenting manifestations is summarized in Fig. 2.

The number of extra morbidities was significantly higher in the ERCP group. Among the patients who were managed with ERCP, the pain scores were significantly higher and 60% of the patients suffered more pain during the management period compared with 25% in the non-ERCP group. Also, vomiting and fever were significantly higher among patients of the ERCP group and the morbidities of ERCP was seen in three patients: pancreatitis in one patient, cholangitis in another and one suffered bleeding from ERCP. Table 2. In group A, conservative management failed in 2/20 patients (10%) and the two patients were sent to undergo ERCP; one case due to continuous bile leak for more than 15 days, while in the second patient, the bile drainage was 1050 and 1150 cc in the third and fourth PO days, respectively. In group B, the first ERCP failed to help in the cessation of bile leak in 2/15 patients (13%) and the patients underwent a second ERCP intervention in which the stent was changed in one patient, while in the second case a stent was inserted in an already sphincterotomized patient. (Table 2).

The mean hospital stay was higher (but not significant) in the non-ERCP group, 5.19±4.72 days vs 4.88±3.41 days in the ERCP group. In our study, 29/35 of patients who suffered from post-LC bile leaks cured well without major complications (Table 2).

Discussion

Since the beginning of LC for the management of gallbladder disease, bile leak has more often been happening due to unpredicted biliary tree injuries [10]. The frequency of bile leak was found to be higher for the less qualified surgeons or at hospitals with a low rate of LC surgery [10]. The most common source of bile leak is the cystic duct stump due to the falling of clips, improper clipping, ischemic change, and later necrosis [11]. However, other several sites may cause a bile leak that includes the variant bile ducts or duct of Luschka, intrahepatic ducts, and common hepatic duct [12]. To avoid unintentional iatrogenic injuries that could lead to bile leakage during LC, surgeons should be aware of the differences in the biliary tree anatomy [13]. Between the available diagnostic modalities, US, CT, and MRCP are noninvasive tools for identifying bile leakage [13]. On the other hand, ERCP, laparoscopy, and laparotomy are diagnostic and therapeutic interventional methods [10].

MRCP is a diagnostic tool for biliary tree obstruction whereas ERCP is mostly used for therapeutic goals. The MRCP is favored as it is noninvasive and safe. MRCP benefits to delineate biliary and pancreatic ducts in addition to the nearby soft tissues which are not possible to be imaged by the ERCP [14,15]. In comparison to ERCP, MRCP is considered as a comparable tool for diagnosing biliary tree diseases. The MRCP is able to define more accurately the extent and the cause of obstruction than ERCP. By MRCP, bile ducts are delineated better distal as well as proximal to the site of obstruction [16].

In our study, percutaneous US-guided drainage and conservative management have been used to decrease the frequency of unnecessary intervention procedures.

Table 2 Data collected during the management of post-LC bile leakage

Data	Strata	Group A	Group B	*P* value
Percutaneous US-guided drainage		6 (30)	5 (33.3)	NS
ERCP from the start (sphincterotomy±stent insertion)		0	15 (100)	NS
Laparoscopy (lavage and drain)		1 (5)	0	NS
Laparotomy (lavage and drain)		0	1 (7)	0.055
Complications*	Pancreatitis	0	3 (20)	0.021
	Bleeding	0	1 (7%)	0.055
	Cholangitis	0	1 (7)	0.055
	Pain	5 (25)	9 (60)	0.016
	Vomiting	1 (5)	4 (27)	0.035
	Fever	1 (5)	5 (14)	0.049
Amount of bile leak/day		260±125 (50–710)	205+110 (40–560)	0.046
The time for fistula closure (days)		6.35±4.22 (3–19)	4.45±1.87 (3–14)	NS
Failure of management	Leak >15 days	1 (5)	2 (13.3)	NS
	Leak >1000 cc for 2 successive days	1 (5)	0	NS
ICU admission (days)		2.91±1.22 (1–5)	3.60±2.17 (2–7)	0.325
Hospital stays (days)		5.19±4.72 (4–21)	4.88±3.41 (3–15)	0.076

Data are presented as mean±SD and numbers; ranges and percentages are in parentheses. ERCP, endoscopic retrograde cholangiopancreatography; US, ultrasonography. *In group B, it a post-ERCP.

The success rate for our conservative management of post-LC bile leakage without ERCP in group A was 18/20 (90%), taking into consideration that the MRCP was done and exclude any major duct injury or transection. On the other hand, only two patients eventually underwent an endoscopic intervention (ERCP) because of a progressively worse bile leak. The authors attributed this progressive bile leakage to sphincter of Oddi dysfunction, which can worsen bile leak by raising the pressure inside the lumen of the bile duct. This explanation was confirmed by the ERCP that was made for both cases and revealed that there was no organic lesion or stones in the bile ducts.

Kook *et al.* [11], in their study about the role of endoscopy in the management of bile leakage, mentioned that most cases of biliary leak can be managed endoscopically. However, any further radiologic intervention or surgery may be essential if bile leak is associated with biliary occlusion or severe stricture. In their study, of the four cases with biliary stricture, one patient underwent conventional laparotomy due to an enormous bile leak in addition to severe bile duct obstruction (by surgical clips). This finding augmented our opinion in the management of post-LC bile leak that depends on the result of MRCP; after MRCP we can categorize the patients individually and decide which patient needs ERCP, laparoscopic exploration, laparotomy, or just conservative management, we should not rush directly to ERCP and expose patients to a possibly unneeded interventional procedure.

Nicholas *et al.* [17] have mentioned in their study that biliary decompression through the ERCP should be accomplished as a complementary measure to make sure a rapid cessation of bile leakage, and at the same time the drainage catheter must be kept in place until the drainage becomes minimal. On the contrary, we found in this study that the endoscopic decompression of biliary pressure through ERCP is not mandatory in every case of bile leakage. Ahmad *et al.* [18], in their study, agree with our results about the management of bile leak following LC; they concluded that the chief indication for ERCP was continuous bile leak and ERCP in their study was performed after a median of five (range: 2–66) days of the original LC. At the same time, the use of ERCP in group B did not prevent the need for laparotomy for repair of the biliary injuries that could not be managed through endoscopic management. The success rate in both groups was identical in the management of post-LC bile leakage. To a higher extent, Michael *et al.* [19] agree with our findings and the conclusion in their study about the endoscopic management of post-LC bile leak that ERCP through sphincterotomy with a stent is effective in curing biliary leakage after LC. At the end, they mentioned that despite prolonged conservative treatment for the biliary leak without endoscopic intervention, patients did well on a long-term follow-up.

Currently, there is no doubt that ERCP plays an essential role in the management of postcholecystectomy bile leakage; it can identify the sites and the amount of leakage, the presence of bile duct stones, and stricture [20,21]. Moreover, ERCP can facilitate the treatment of the bile leak through endoscopic sphincterotomy with or without biliary stenting [22]. The base for the stoppage of bile leaks with ERCP management depends theoretically on bridging the leak site and abolition of the pressure gradient between the duodenum and CBD, which declines flow resistance and diverts the bile flow into the duodenum, subsequently helping leak stoppage [20]. Frequent researches have helped us to define the probable ERCP complication rates; pancreatitis (mild, moderate, and severe) in a meta-analysis of 21 studies was reached to 15.7% [23]. In the same study, hemorrhage related to ERCP was 1.3%, gut perforation was 0.6%, and the rate of post-ERCP cholangitis is approximately 1% and is considered as one of the most serious complications of ERCP [23,24]. A wide variety of other complications of the ERCP have been described in these studies and included ileus, hepatic abscess, duodenal hematoma, air in the portal vein, and impaction of the stone retrieval basket [23,24]. Complications of stents placed through ERCP have also been reported, including stent occlusion, stent migration, bowel perforation, liver abscess, and injury to the biliary duct or pancreatic duct [22]. Identification of potential complications of ERCP, their incidence, and their risk factors may help to minimize the frequency of shifting our post-LC bile leakage patient to undergo ERCP [22]. The limitation of this study was the relatively small number of cases. Therefore, a big multicenter study is required to confirm the need for ERCP in cases of post-LC bile leakage.

Conclusion

Due to the probability of serious complications post-ERCP, we should try to limit the use of this invasive maneuver in the management of post-LC bile leakage and restrict ERCP to the cases of missed stone, major duct injury, or cases that failed the conservative management for more than 15 days or patients with a drainage of more than 1000 in a 2 successive days of conservative management.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Tzovaras G, Peyser P, Kow L, Wilson T, Padbury R. Minimally invasive management of bile leak after laparoscopic cholecystectomy. HPB 2001; 3:165–168.

2 Haim P, Patrick G. Biliary leaks after laparoscopic cholecystectomy: time to stent or time to drain. Hepatobiliary Pancreat Dis Int 2008; 7:628–632.

3 Pramod K, Sundeep S, Mohammed N, Barjesh C, Nilesh P. Bile duct injury – from injury to repair: an analysis of management and outcome. Indian J Surg 2015; 77(Suppl 2):S536–S542.

4 Harpreet K, Elliot K. Complications of endoscopic retrograde cholangiopancreatography: spectrum of abnormalities demonstrated with CT1. RG. 2001; 21:1441–1453.

5 Mallery J, Baron T, Dominitz J. Complications of ERCP. Gastrointest Endosc 2003; 57:633–638.

6 Freeman ML, Nelson DB, Sherman S, Haber GB, Herman ME, Paul RN, *et al.* Complications of endoscopic biliary sphincterotomy. N Engl J Med 1996; 335:909–918.

7 Wang P, Li ZS, Liu F, Ren X, Lu NH, Fan ZN, *et al.* Risk factors for ERCP-related complications: a prospective multicenter study. Am J Gastroenterol 2009; 104:31–40.

8 Williams EJ, Taylor S, Fairclough P, Hamlyn A, Logan RF, Martin D, *et al.* Risk factors for complication following ERCP; results of a large-scale, prospective multicenter study. Endoscopy 2007; 39:793–801.

9 Andriulli A, Loperfido S, Napolitano G, Niro G, Valvano MR, Spirito F, *et al.* Incidence rates of post-ERCP complications: a systematic survey of prospective studies. Am J Gastroenterol 2007; 102:178I–1788I.

10 Colton J, Curran C. Quality indicators, including complications, of ERCP in a community setting: a prospective study. Gastrointest Endosc 2009; 70:457–467.

11 Kim K, Kim T. Endoscopic management of bile leakage after cholecystectomy: a single-center experience for 12 years. Clin Endosc 2014; 47:248–253.

12 Kim J, Kim W, Kim H, Yoo B, Kim M. Management of patients who return to the hospital with a bile leak after laparoscopic cholecystectomy. J Laparoendosc Adv Surg Tech A 2010; 20:317–322.

13 Vinay R, Akin B, Anna F, Charles F. Successful treatment of persistent postcholecystectomy bile leak using percutaneous cystic duct coiling. Hind Pub Corp 2015; 2015, Article ID 273198, 3 pages

14 Romagnuolo J, Bardou M, Rahme E, Joseph L, Reinhold C, Barkun AN. Magnetic resonance cholangiopancreatography: a meta-analysis of test performance in suspected biliary disease. Ann Intern Med 2003; 139:547–557.

15 Misra SP, Dwivedi M. Complications of endoscopic retrograde cholangiopancreatography and endoscopic sphincterotomy: diagnosis, management and prevention. Natl Med J India 2002; 15:27–31.

16 Mahaboobkhan A, Manikandan P, Anandan H. Accuracy of magnetic resonance cholangiopancreatography vs endoscopic retrograde cholangiopancreatography in pancreaticobiliary disorders. Int J Sci Stud 2017; 5:197–199.

17 Nicholas M, Firas H. Complications of endoscopic retrograde cholangiopancreatography: how to avoid and manage them. Gastroenterol Hepatol (N Y) 2013; 9:496–504.

18 Ahmad F, Saunders R, Lloyd G, Lloyd D, Robertson G. An algorithm for the management of bile leak following laparoscopic cholecystectomy. Ann R Coll Surg Engl 2007; 89:51–56.

19 Michelle A, Laurel F, Rajeev J, John A, Vasundhara A, Tamir B, *et al.* The American Society for Gastrointestinal Endoscopy Guideline, Complications of ERCP. Gastro Endo 2012; 75:467–473.

20 Dolay K, Soylu A, Aygun E. The role of ERCP in the management of bile leakage: endoscopic sphincterotomy vs biliary stenting. J Laparoendosc Adv Surg Tech A 2010; 20:455–459.

21 Han J. The crucial role of biliary endoscopists in the management of bile leak after cholecystectomy. Clin Endosc 2014; 47:210–211.

22 Ryan M, Geenen J, Lehman G, Aliperti G, Freeman M, Silverman W, *et al.* Endoscopic intervention for biliary leaks after laparoscopic cholecystectomy: a multicenter review. Gastrointest Endosc 1998; 47:261–266.

23 Christensen M, Matzen P, Schulze S, Rosenberg J. Complications of ERCP: a prospective study. Gastrointest Endosc 2004; 60:721–731.

24 Hiroyuki M, Hirosato M, Masanori S, Satohiro M. Post-ERCP biliary complications in patients with biliary-type sphincter of Oddi dysfunction. Sci Rep 2018; 8:9951.