Endoscopic retrograde cholangiopancreatography versus conservative treatment of biliary leakage due to injury of Luschka duct during laparoscopic cholecystectomy

Mohamed Abdelshafy Mohamed, Mohamed Yousef A., Mohamed A. Omar, Ahmed Saada, Asmaa Gaber R

Department of General Surgery, Faulty of Medicine, South Valley University, Qena, Egypt

Correspondence to Mohamed Y. Ahmed, MD, Department of General Surgery, Qena Faculty of Medicine, South Valley University, Qena 83511, Egypt. Mob: +201006900340; Fax: +20 963 227 406; E-mail: myousef76@gmail.com

Received: 26 February 2023
Revised: 8 March 2023
Accepted: 19 March 2023
Published: 9 June 2023

The Egyptian Journal of Surgery 2023, 42:340–345

Background
Gallstones remain the most common disease of gastrointestinal tract in the world. Laparoscopic cholecystectomy is one of the most common performed surgical operations. Bile leaks remain a significant cause of morbidity for patients undergoing laparoscopic cholecystectomy and these occur in 0.3–0.8% of cases. The ducts of Luschka, or subvesical ducts, are small ducts originate from the right hepatic lobe, course along the gallbladder bed, and usually drain into the extrahepatic bile ducts. Injury of these ducts is the second most frequent cause of postcholecystectomy bile leakage after cystic duct leak.
Aim
The aim of this study is to compare between conservative and endoscopic retrograde cholangiopancreatography (ERCP) treatment of leaked injured Luschka duct as regarding outcomes, effectiveness, and cost.
Patients and methods
Retrospective study included patients with postcholecystectomy biliary leakage due to Luschka duct injury from June 2015 to December 2022.
Results
A total of 20 patients were included in this study and classified into two groups: group A with conservative treatment was successful in eight cases within 2–3 weeks and two cases reoperated, one with relaparoscopy with drainage and one cases reoperated with open exploration and ligation of leaked duct while group B with 10 cases treated with ERCP, all patients treated successfully with ERCP sphincterotomy and stent placement and leaks stopped and discharged within third or fourth day without any morbidity, no mortality in both groups.
Conclusion
Treatment of biliary leakage due to injured Luschka (subvesical duct) with ERCP sphincterotomy and stent placement is safe and effective without any morbidity or mortality.

Keywords:
cholecystectomy, endoscopic retrograde cholangiopancreatography, laparoscopic, Luschka duct, postcholecystectomy biliary leakage, subvesical duct

Egyptian J Surgery 42:340–345

1110-1121

Introduction

Laparoscopic cholecystectomy (LC) has become the gold standard for treatment of symptomatic gallbladder stones. The incidence of biliary leaks after LC was estimated at 0.3–0.8% [1].

Postcholecystectomy leakage most commonly arises from the cystic duct or a duct of Luschka (Amsterdam type A leaks). The duct of Luschka was first described in 1863 by Hubert von Luschka, and it is an accessory bile duct that originates from right hepatic lobe, located very near to the gallbladder fossa, and drains into the right or common hepatic duct [2].

Incidence of the duct of Luschka in the population is unknown and ranges vary from 0.5 to 15% according to published series [2].

Injury of duct of Luschka during LC is commonly produced by an excessive dissection of deep plane of gallbladder without the particular anatomical localization of this accessory duct. Injury of duct of Luschka is not usually identified during LC and clinically manifests in the first postoperative days [3].

Injury of duct of Luschka can cause biliary peritonitis, biloma, or subphrenic or subhepatic intra-abdominal abscess and patients clinically manifest by abdominal pain, fever, and jaundice [4].

There were many modalities to diagnosis biliary leakage as cholescintigraphy [hydroxyiminodiacetic acid (HIDA scan)], computed tomography (CT), and magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP) that not only demonstrate the site of duct leakage but also confirm the diagnosis, but also to exclude the presence of retained stones and strictures prior to initiating therapy [5].

The aim of this study is to compare between conservative and ERCP treatment of leaked inured Luschka duct as regarding outcomes, effectiveness and cost.

Patients and methods

All the patients with biliary leakage due to injury of Luschka duct and admitted at General Surgery Department and Emergency Department at Qena University Hospitals, South Valley University in the period from June 2015 to December 2021 were included in this study.

Type of study: a retrospective comparative cohort study.

Patients were classified into two groups:

Group A: conservative treatment.
Group B: ERCP sphincterotomy and stent placement.

The Institutional Ethics Committee approved this study. All these patients were consented (oral and written informed consent) and subjected to:

Complete clinical assessment including full history taking and complete clinical examination. Full routine investigations including complete blood count, blood sugar, serum creatinine, prothrombin time and concentration, serum electrolytes level, Screening for Human Immunodeficiency Virus (HIV), Hepatitis C (HCV), Hepatitis B surface antigen (HBsAg), Electrocardiogram (ECG), and liver function tests. Abdominal ultrasonography: help in detection of the amount of intraperitoneal fluid collection and abdominal CT (Fig. 1) and MRCP.

Results

A total of 20 patients were included in this study and classified in to two groups:

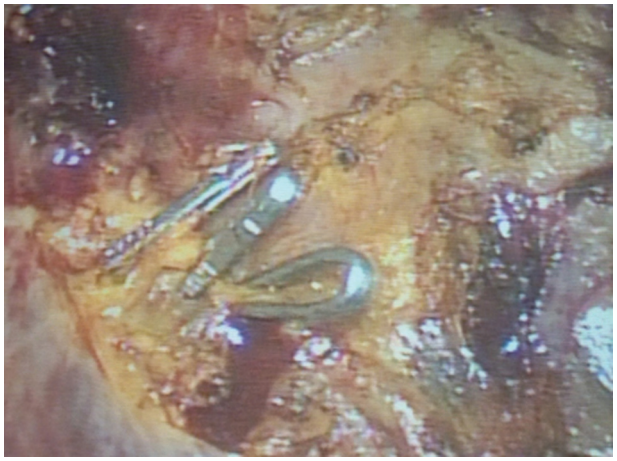
Group A: conservative treatment, group B: ERCP treatment.

Each group included 10 patients.

Group A: conservative group included 10 patients: eight females and two males, their ages ranges from 25 to 60 year with mean 42±16 years, biliary leak detected in drain at first day after LC by drain bile leak and treated conservatory, eight patients with bile leak less than 200 ml and all closes at 7–12 days, and two patients with bile leak more than 200 ml and treated conservatively with drainage and antibiotics, both of them developed biliary peritonitis, one at day 8 and the other at 10 days, and one reoperated by relaparoscopic washing and drainage (Fig. 2) and the other with open exploration washing and drainage.

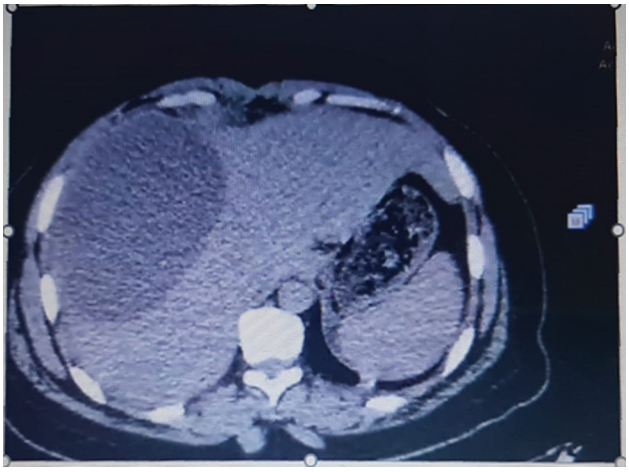
Group B: ERCP group included 10 patients: seven females and three males, their ages ranges from 20 to 60 year with mean 40±20 years. Six patients with bile

Figure 1



Computed tomography abdomen shows subhepatic bile collection.

Figure 2



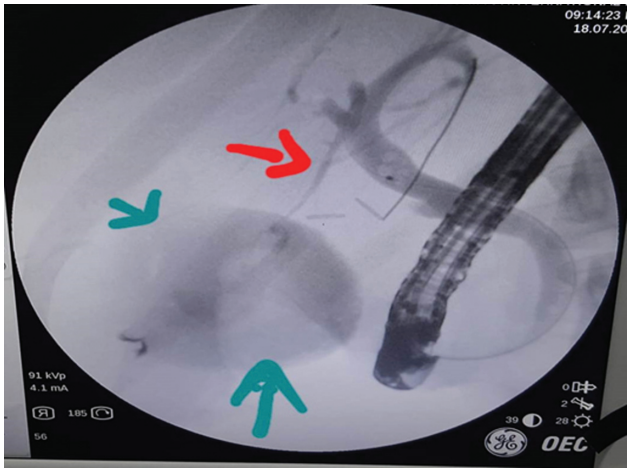
Liver bed during laparoscopic cholecystectomy with clips on injured Luschka duct.

leak less than 200 ml and four patients with bile leak more than 200 ml and all were treated by ERCP and sphincterotomy and stent placement at second day (Figs 3–5). Bile leaks were stopped after ERCP and patients were discharged from hospital at third day without any morbidity or mortality.

Discussion

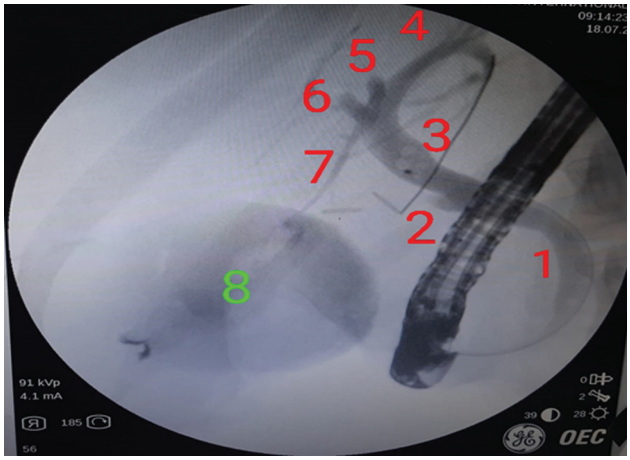
Bile leaks occur in 0.2–2% of cases of LC [8]. Cystic duct leakage and injury to the ducts of Luschka are a relatively common cause of postcholecystectomy biliary leakage. Although, there are increasing in large collective experience in LC, the incidence of leakage due to injured Luschka duct has not decreased [3].

Figure 3



Endoscopic retrograde cholangiopancreatography cholangiography: green arrow shows contrast leakage while red arrow shows Luschka duct.

Figure 4



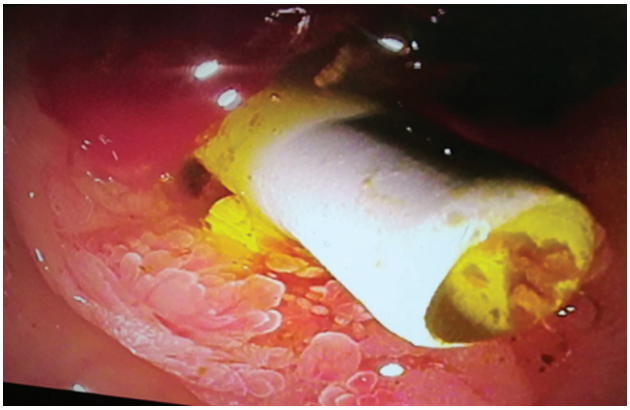
Endoscopic retrograde cholangiopancreatography cholangiography show aberrant Luschka duct [6] and bile leakage [7].

Small biliary channels with a diameter of 1–2 mm, known as the ducts of Luschka (subvesical duct), often emerge from the right hepatic lobe. One duct or a network of ductules may be present [6]. Other names for the Luschka ducts are accessory biliary ducts, subvesicular ducts, and vasa aberrantia. They affect 20–50% of the population [2,6,7].

When performing an LC, the cystic artery and cystic duct are divided and the gallbladder is separated from its fossa in the liver bed. This plane of the gallbladder dissection may be lost in situations when there is acute or chronic inflammation, when cautery is used unwisely, or when the surgeon is inexperienced. Also, when dealing with an 'intrahepatic' gallbladder, it could be challenging to maintain [9]. The connection of the injured Luschka duct with the central biliary system affects how much bile spills as a result of the lesion. The leak is often self-limiting and limited in volume if the cut end does not connect with the central biliary tree. The amount of bile leakage may be significant if the cut end connects with the extrahepatic bile ducts. The number of leaks from a subvesical duct leak may increase if the common bile duct is distally blocked by stones or sphincter of Oddi spasm [7].

The clinical signs of subvesical duct leaks rely on a variety of variables, including the amount and distribution of bile in the peritoneal cavity, whether it is sterile or infectious, and whether a drain is present or not. In a minority of people, it is often asymptomatic. In their study [10], Hasl and colleagues showed that 7% of cholecystectomy patients had subclinical bile leaks. The sole symptom in some people may be the outflow of bile through a surgically implanted drain, but the

Figure 5



Endoscopic retrograde cholangiopancreatography sphincterotomy and stent placement.

majority of patients may have minor stomach discomfort, soreness, fever, or biliary peritonitis with sepsis. Most patients' blood bilirubin and alkaline phosphatase levels are somewhat elevated. In general, stomach symptoms that are out of the ordinary for the postoperative course may indicate leaking.

Regarding time, leakage often manifests within the first postoperative week [11]. A small percentage of people may have it weeks following surgery [12]. In individuals with drains, bile may be detected early. Bile can range in size from 100 ml to more than 2 l [11–13].

Surgical bile duct injuries were the subject of a categorization system created by Strasberg *et al.* [11]. This categorization designates leaks from the Luschka duct as 'Class A' injuries. Leaks from the gallbladder fossa and cystic duct stumps fall under this category. Rarely are these injuries discovered during surgery.

Bile leak from the gallbladder bed or direct imaging of the injured bile duct may be used to detect Luschka duct injury intraoperatively. Four cases of a damaged subvesical duct discovered after cholecystectomy were described in a research by McQuillan *et al.* [4]. One patient had a subvesical duct confirmed by an intraoperative cholangiogram, whereas the procedure failed in another patient. Cholangiography was not done on the other two patients. The duct injuries were fixed by suture ligation or clip application.

The study of a postoperative bile leak following LC will reveal any postoperative discovery of biliary leakage from injured subvesical ducts. In general, an abdominal ultrasound or CT scan will be used to investigate a patient whose clinical presentation does not suggest a typical postoperative outcome. An external drainage catheter has to be inserted under radiologic guidance if there is a fluid accumulation that also contains bile. Many bile leaks will spontaneously stop [3].

One of the easiest ways to identify a biliary leak is with fistulography, which is one of the various imaging modalities available to diagnose bile leak from damaged Luschka duct. During fluoroscopy, retrograde instillation of contrast is carried out through a surgically or percutaneously implanted drain. This is done to show whether or not there is connection with the biliary tree. According to some authors [7,14], this should be the first research carried out in suspected instances. Furthermore, HIDA scintigraphy can be used to find leaks. Not only can HIDA scintigraphy identify bile leaks, but it also offers inadequate anatomical information. Extravasations of radionuclide from the gallbladder fossa will demonstrate a subvesical duct damage [5].

The most often utilized method for identifying Luschka (subvesical) duct leakage is ERCP [15]. In a research by Vitellas *et al.* [16], they conducted MRCP with intravenous mangafodipir trisodium (Teslascan) in patients with a suspected bile leak following cholecystectomy. Lately, MRI has been adopted for detection. Contrast agent Teslascan is mostly eliminated through the biliary tract. Eleven patients underwent research. Five of the six biliary leakages in six individuals were verified by an ERCP. A sensitivity of 86% and a specificity of 83% were reported by the authors. It appears to be an improvement over traditional MRCP, which cannot distinguish between bile and free fluid.

In some instances of postoperative biliary leakage when damaged subvesical ducts may be seen, reoperation with relaparoscopy can be done [17,18]. Reoperations are typically carried out when less intrusive methods have failed to find or fix the leak, when they are not available, or when the symptoms are severe enough to warrant another look.

The treatment of biliary leakage due to injured Luschka (subvesical) ducts depends on many factors such as clinical condition of the patient, availability imaging and interventional modalities. In cases of asymptomatic patients with low-output bile leaks, simple drainage may sufficient. Spontaneous resolution of the leak may occur because subvesical ducts do not drain significant portions of liver parenchyma. ERCP with sphincterotomy, stenting, or naso-billary tube placemen twill lower the biliary tree pressure gradient with preferential bile flow through the papilla [19–22]. In patients with severe symptoms and in those in which leakage continues despite endoscopic treatment, reexploration with laparoscopy is acceptable. If an injured subvesical duct is noted, ligation should be performed. The important point of management is to drain the bile collection externally regardless of the modalities of the treatment used.

In study by Wills *et al.* [23], on 1779 patients, they reported that only 15 patients with postcholecystectomy biliary leakage, 10 (67%) patients with injury of Luschka duct and treated by relaparoscopy visualization of leaked Luschka duct and ligation in eight patients and, drainage only in two

patients and they also reported that suture ligature is preferable because clip application may actually be difficult [23]. In study by Misra *et al*. [24], on 954 patients 11 patients with biliary leakage five (45%) patients of them were due to Luschka duct and two patients of them were treated by relaparoscopy ligation and two patients are treated by ERCP stent and they used fibrin glue to gallbladder fossa in one patient during relaparoscopy and leaks stopped [24]. Finally, hepaticojejunostomy may be used in cases in which leaks persisted despite treatment with all other methods [7].

In a study by Braghetto *et al*. [25], on 5200 patients undergoing cholecystectomy, they found that postcholecystectomy biliary leakage occurred in 13 patients and three (32%) patients due to Luschka duct injury and treated by relaparotomy and visualization of leaked bile and ligate it while in another study by Wills *et al*. [23].

But in study by Kimura *et al*. [3], on 1365 patients with 32 patients with postcholecystectomy leakage, in 17 patients, leakage due to Luschka duct injury and drainage was sufficient. In study by Brooks *et al*. [22], on 650 patients undergoing cholecystectomy, they found that only nine patients had biliary leakage and two patients from these patients with Luschka duct injured and treated by ERCP and sphincterotomy [22]. In another study by Sandha *et al*. [15], postcholecystectomy leaks occurred in 207 patients, 26 patients from them leakage occurred due to Luschka duct injury and treated by ERCP sphincterotomy and stent, also in studies by Kaffes *et al*. [19] and De Palma *et al*. [17], they treated Luschka duct injuries by ERCP and stent, while in study by Mergener *et al*. [7], on 86 with postcholecystectomy biliary leakage, 15 (17%) patients of them due to Luschka duct and 11 patients was treated by ERCP and stent and ERCP plus sphincterotomy alone in one patients and hepaticojejunostomy in two patients, transhepatic drain in one patients.

In our study 20 patients with biliary leakage due to injured Luschka duct (subvesical duct), 10 patients treated conservatively with external drainage and 10 patients with ERCP sphincterotomy and stent placement. In patients with conservative treatment eight patients treated successfully by drainage and leakage stopped within 2–3 weeks and two patients of them reoperated, in which in one patient we visualize inured duct and treated by clipping, and the other with septic peritonitis only washing and drainage and in all 10 patients treated with ERCP after diagnosis and all treated successfully by ERCP stent and discharged from hospital at third day. So ERCP treatment is effective in all our cases with low cost as patients discharged early from hospitals with early return to work.

In summary: gallstone disease remains the most common disease of gastrointestinal tract in worldwide. LC is one of the most common surgical operations performed. Bile leaks remain a significant cause of morbidity for patients undergoing LC and these occur in 0.2–2% of cases. The bile ducts of Luschka are small ducts which originate from the right hepatic lobe, course along the gallbladder bed, and usually drain into the extrahepatic bile ducts. Injury of these ducts is the second most frequent cause of postcholecystectomy bile leakage after cystic duct leak. Postcholecystectomy leaks from injured Luschka (subvesical) bile ducts remain an infrequent event. They are responsible for different degrees of morbidity to patients and are source of matter of controversy and challenge even with the most experienced of surgeons as there does not seem to be a 'Luschka leak learning curve' because Luschka duct injuries continue to occur with similar frequency, in contrast with major bile duct injuries which decrease with learning curve. Preoperative detection of subvesical ducts and other variation of biliary anatomy using imaging studies such as DIC-CT and MRCP may assist in injury prevention but will definitely increase overall cost. These injuries may occur during elective and emergent cases; it may be missed during intraoperative cholangiography and are detected mostly in the postoperative period. Drainage of bile is mandatory in all cases. Reduction of intrabiliary pressure with endoscopic sphincterotomy and stent placement will lead to preferential flow of bile through the papilla, and this permitting subvesical duct injuries to heal.

Conclusion

Knowledge and better understanding of the anatomy of the biliary tree with its well-known tendency for structural variations is important to surgeons in preventing and managing operative injury to the subvesical (Luschka) ducts. Staying near to the gallbladder wall during its removal from its bed is the only known prophylactic measure. Early detection of bile leaks and drainage is mandatory in all cases. Definitive treatment of biliary leakage due injured Luschka (subvesical duct) with ERCP sphincterotomy and stent placement is safe and

effective without any morbidity or mortality and with low cost as it permits early return to work.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Hassan AM, Mohammed AQ. Biliary leak after laparoscopic cholecystectomy: incidence and management. Egp J Surg 2021; 40:685–694.

2 Frakes JT, Bradley SJ. Endoscopic stent placement for biliary leak from an accessory duct of Luschka after laparoscopic cholecystectomy. Gastrointest Endosc 1993; 39:90–92.

3 Kimura T, Suzuki K, Umehara Y, Kawabe A, Wada H. Features and management of bile leaks after laparoscopic cholecystectomy. J Hepatobiliary Pancreat Surg 2005; 12:61–64.

4 McQuillan T, Manolas SG, Hayman JA, Kune GA. Surgical significance of the bile duct of Luchska. Br J Surg 1989; 76:696–698.

5 Ramachandran A, Gupta SM, Johns WD. Various presentations of postcholecystectomy bile leak diagnosed by scintigraphy. Clin Nucl Med 2001; 26:495–498.

6 Champetier J, Davin JL, Letoublon C, Laborde Y, Yver R, Cousset F. Aberrant biliary ducts (vasa aberrantia): surgical implications. Anat Clin 1982; 4:137–145.

7 Mergener K, Strobel JC, Suhocki P, Jowell PS, Enns RA, Branch MS, Baillie J. The role of ERCP in diagnosis and management of accessory bile duct leaks after cholecystectomy. Gastrointest Endosc 1999; 50:527–531.

8 Albasini JL, Aledo VS, Dexter SP, Marton J, Martin IG, McMahon MJ. Bile leakage following laparoscopic cholecystectomy. Surg Endosc 1995; 9:1274–1278.

9 Constantine P. Spanos and Theodore Syrakos. Bile leaks from the duct of Luschka (subvesical duct): a review. Langenbecks Arch Surg 2006; 391:441–447.

10 Hasl DM, Ruiz OR, Baumert J, Gerace C, Matyas JA, Taylor PH, Kennedy GM. A prospective study of bile leaks after laparoscopic cholecystectomy. Surg Endosc 2001; 15:1299–1300.

11 Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg 1995; 180:101–125.

12 Albishri SH, Issa S, Kneteman NM, Shapiro AMJ. Bile leak from duct of Luschka after liver transplantation. Transplantation 2001; 72:338–340.

13 Thompson RW, Schuler JG. Bile peritonitis from a cholecystohepatic bile ductule: an unusual complication of cholecystectomy. Surgery 1986; 99:511–513.

14 Suhocki PV, Meyers WC. Injury to aberrant bile ducts during cholecystectomy. A common cause of diagnostic error and treatment delay. Am J Roentgenol 1999; 172:955–959.

15 Sandha GS, Bourke MJ, Haber GB, Kortan PP. Endoscopic therapy for bile leak based on a new classification: results in 207 patients. Gastrointest Endosc 2004; 60:567–574.

16 Vitellas KM, El-Dieb A, Kuldeep KV, William FB, John F, Christopher E, James GB. Using contrast-enhanced MR cholangiography with IV mangafodipir trisodium (Teslascan) to evaluate bile duct leaks after cholecystectomy: a prospective study of 11 patients. Am J Roentgenol 2002; 179:409–416.

17 De Palma GD, Galloro G, Iuliano G, Puziello A, Persico F, Masone S, Persico G. Leaks from laparoscopic cholecystectomy. Hepatogastroenterology 2002; 49:924–925.

18 Azagra JS, De Simeone P, Goergen M. Is there a place for laparoscopy in management of postcholecystectomy biliary injuries?. World J Surg 2001; 25:1331–1334.

19 Kaffes AJ, Hourigan L, De Luca N, Byth K, Williams SJ, Bourke MJ. Impact of endoscopic intervention in 100 patients with suspected postcholecystectomy bile leak. Gastrointest Endosc 2005; 61:269–275.

20 Lin RK, Hunt GC. Left hepatic duct of Luschka. Gastrointest Endosc 2004; 60:984.

21 Elmi F, Silverman WB. Nasobilary tube management of postcholecystectomy bile leaks. J Clin Gastroenterol 2005; 39:441–444.

22 Brooks DC, Becker JM, Connors PJ, Carr-Locke DL. Management of bile leaks following laparoscopic cholecystectomy. Surg Endosc 1993; 7:292–295.

23 Wills VL, Jorgensen JO, Hunt DR. Role of relaparoscopy in the management of minor bile leakage after laparoscopic cholecystectomy. Br J Surg 2000; 87:176–180.

24 Misra M, Schiff J, Rendon G, Rothschild J, Schwaitzberg S. Laparoscopic cholecystectomy after the learning curve. What should we expect?. Surg Endosc 2005; 19:1266–1271.

25 Braghetto I, Bastias J, Csendes A, Debandi A. Intraperitoneal bile collections after laparoscopic cholecystectomy. Causes, clinical presentation, diagnosis and treatment. Surg Endosc 2000; 14:1037–1041.