

Management of Bile Leak after Laparoscopic Cholecystectomy

Ali Momtaz Bikhtiyar, Sattar Jabbar Kadhim

ABSTRACT:

BACKGROUND:

Bile leak after laparoscopic cholecystectomy is not an uncommon complication, it's a serious one and its management requires a lot of resources, and expertise. The evolution of laparoscopic cholecystectomy and being the standard of management had a disadvantage of slightly elevating bile leak incidence.

OBJECTIVE:

To identify the best way management to decrease the burden on the patient either quick healing, decrease complications and outline the complications after management modalities.

PATIENTS AND METHODS:

This is a prospective study describing route of management from the period January 2018- January 2019 in Al-Yarmouk Hospital and Gastrointestinal and hepatology teaching Hospital. Where 34 patients enrolled for bile leak after laparoscopic cholecystectomy. Patients were followed from their admission, investigations, determining site of leakage, choosing the method of management according to out-put grade, site. Comparing closure time and complications related to each.

RESULTS:

The study involved 34 patients who were managed for bile leak, mean age 42.13. Females were 76.5% (26), males were 23.5% (8). ERCP and MRCP used to determine the site of leakage: cystic duct 55.9% (19), liver bed 8.8% (3) and major duct injuries: Strasberg D 32.4% (11) and Strasberg E1 2.9% (1). These sites further divided in to low-grade <300 cc/day 73.5% (25) and high-grade >300 cc/day 26.5% (9). Management was according to site and grade of leak: conservative 23.5% (8), Endoscopic Retrograde Cholangiopancreatography alone/stent 70.6% (24) and surgical reconstruction 5.9% (2). All patients were followed for 4 months. These modalities compared to each other in terms of closure time and complications.

CONCLUSION:

Some patients with bile leak can be managed using conservative measures alone. Sphincterotomy alone can be used in low grade leaks, from cystic duct. High grade, major duct injuries is best managed with sphincterotomy plus stenting to enhance healing.

Although conservative management or sphincterotomy alone decreases the complications rate but carries a disadvantage of delaying closure time.

Sphincterotomy plus stenting enhances closure time over other methods.

KEYWORDS: Bile leak, endoscopic retrograde cholangio-pancreatography sphincterotomy.

INTRODUCTION:

Using laparoscopy for cholecystectomy as compared to open cholecystectomy was tainted with increased rates of injury and this was more profound in the early usages. This was not the case in the early years of its invention only but it happens for the same surgeon in his beginning of the learning curve by 3%⁽¹⁾.

When such leakage is encountered it can be treated with endoscopy or surgery. For the former using Endoscopic Retrograde Cholangiopancreatography (ERCP) can be employed with the options of cutting the sphincter of Odi^(2, 3). Or placing a prosthetic passage in the form of stent and this can sometimes eliminate the need for sphincterotomy and its complications in addition they have the same efficacy for the end result^(4, 5).

While using open surgery to correct the leakage can be performed immediately if it was discovered intraoperatively or after 2 months^(6, 7).

Al-Yarmouk Teaching Hospital. Baghdad, Iraq

BILE LEAK MANAGEMENT

As endoscopy, surgery has types that can be selected from: (8, 9):

- Roux-en-Y hepaticojejunostomy.
- End-to-end ductal biliary anastomosis.
- Jejunal interposition hepaticoduodenostomy.
- Heinecke-Mikulicz biliary plastic reconstruction.
- Smith mucosal graft.

AIM OF STUDY:

- Evaluate pre-operative indications for L.C and their time of operation that may play a part in bile leak.
- Bile leak management in the best way to decrease the burden on the patient: quicken healing or lessen complications and most common complications that may occur.

PATIENTS AND METHODS:

Study design

This is a prospective study, which was conducted in AL-Yarmouk Teaching Hospital and GIT Hospital (It is a multicenter study; patient sample was taken in both hospitals) from 1st January 2018 to 1st January 2019 including patients suffering from bile leak complicating laparoscopic cholecystectomy; operated and managed in AL-Yarmouk Teaching Hospital and others were referred to Gastroenterology and Hepatology Teaching Hospital from others. All of them were operated with laparoscopic cholecystectomy for benign conditions including acute calculus

cholecystitis, chronic calculus cholecystitis and biliary colic due to gall stones.

Inclusion Criteria:

Inclusion criteria were patients undergoing a cholecystectomy with a benign pathology diagnosis, including acute cholecystitis, biliary colic, choledocholithiasis or gallstone pancreatitis.

Exclusion criteria:

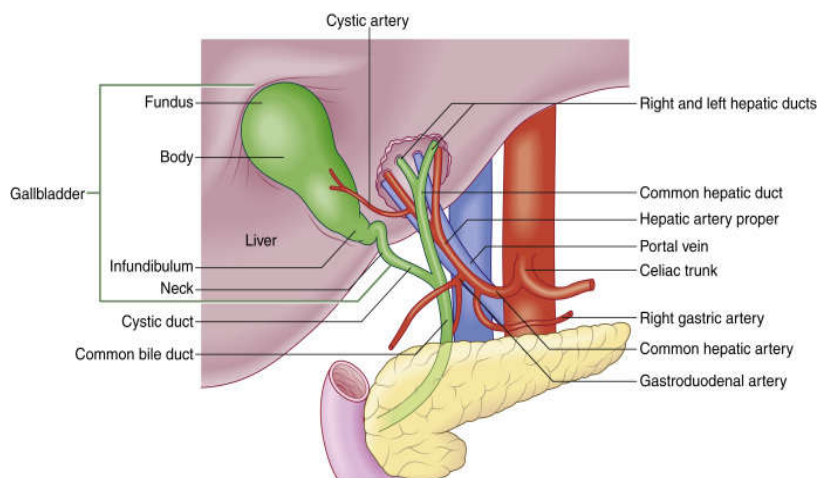
of any other causes of bile leak; trauma, hydatid cyst communication with bile tree, open chole, and intentional CBD exploration for retained stones.

All patients were admitted to the surgical ward & assessment of patients were done. Through history, Physical examination, laboratory investigations (including CBC, LFT, TSB, RFT, bleeding profile, S. Electrolytes) and radiological evaluation (abdominal US, MRCP for all of them to aid determine the site of possible leak.

All patients were resuscitated at the surgical ward, with IV fluid, anti-biotics, vit. K.

Patients presented were classified to early (1st week) and late post op. period (2-3 weeks). Determining the amount of bile depending either from the drain or Peritoneal Dialysis catheter put under US guidance (draining the peritoneum for 1 day then cessation of oral intake for another 1 day then we calculated the base output) to < 300cc (mild), > 300cc (moderate to severe).

Anatomy of the gallbladder:



Strasberg classification

Was meant to differentiate between small (bile leakage from the cystic duct or aberrant right sectoral branch) and serious injuries performed during LC, (fig. 1.1) ⁽¹⁰⁾.

The Bismuth classification is a simple classification based on the location of the injury in the biliary tract. It included five types of bile duct injuries and involves ⁽²⁴⁾:

Type I: involves the common bile duct and low common hepatic duct (CHD) >2 cm from the hepatic duct confluence.

Type II: involves the proximal CHD <2 cm from the confluence.

Type III: hilar injury with no residual CHD confluence intact.

Type IV: destruction of the confluence with right and left hepatic ducts separate.

Type V: involves the aberrant right sectoral hepatic duct alone or with concomitant injury of CHD.

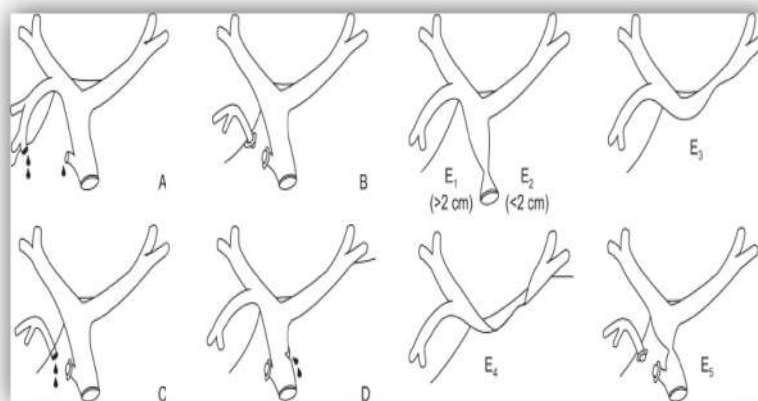


Figure 1.1 Strasberg classification ⁽¹⁰⁾

Bile leak was managed either by surgical or non-surgical procedures

The non-surgical procedures include:

- a) US-guided drainage, chosen for simple collection.
- b) ERCP, sphincterotomy and stent inserted: ERCP was chosen for more complicated cases. The duodenoscope is advanced to the second portion of the duodenum and aligned with the major papilla in order to achieve access to the biliary and/or pancreatic ducts. Once deep cannulation of sphincter of Odi has been achieved, radiopaque contrast is injected. Removal of stones and placement of prostheses, endoscopic sphincterotomy is most commonly performed using a bow-type traction sphincterotome passed over a previously placed guidewire. Plastic stents of 10F (available in our hospitals) were used in some cases, and they were removed after four months.

- c) Surgical procedure: was done for two patients; due to failure of endoscopy in one patient, the other had complete transection from the start so was ruled out preoperatively. Operations done after 2 months from drainage. Passing jejunum loop retro-colically performing end to side hepaticojejunostomy with a tension free suturing by non-absorbable material.

All Patients were followed for one month, free of leak, no jaundice and normal liver enzymes.

RESULTS:

The total number of patients enrolled in this study was 34. All of them were suffering from biliary leak complicating laparoscopic cholecystectomy.

Three patients (8.8%) were below 30 years, 28 patients (82.4%) were between 30-50 and 3 (8.8%) were older than 50 years.

Eight patients (23.5%) were male and 26 patients (76.5%) were female.

BILE LEAK MANAGEMENT

Eight (23.5%) patients presented biliary peritonitis, 13 (38.2%) presented with external biliary fistula, 7 (20.6%) with biloma and 6 patients (17.6%) presented with jaundice.

Twenty-eight patients (79.4%) presented within the 1st week (6 patients managed in Al-Yarmouk hospital, 28 in GIT hospital) and Six patients (17.6%) presented during 2nd – 3rd weeks.

Table1: distribution of study patients by laparoscopic cholecystectomy related information.

Variable	No. (n= 34)	Percentage (%)
Cause of Operation		
Acute Cholecystitis	17	50.0
Chronic Cholecystitis	13	38.2
Gall Stone	4	11.8
Time of Operation after Initial Diagnosis		
72 hrs.	4	11.8
> 6 wks.	30	88.2
Operation Method		
Laparoscopic only	27	79.4
Laparoscopic with conversion	7	20.6

(Due to injuries done by other surgeons so couldn't obtain an accurate estimation of operation time and also, we couldn't get accurate intraoperative details because of bias issues).

Table 2: Distribution of study patients by bile leak information.

Variable	No. (n= 34)	Percentage (%)	
Amount of bile leak			
< 300 cc	25	73.5	
≥ 300 cc	9	26.5	
Source of bile leak			
Cystic stump Strasberg A	19	55.9	
Major duct	Strasberg D	11	32.4
	Strasberg E1	1	2.9
Liver bed, duct of Luschka	3	8.8	

(Cases of cystic duct were 19 cases, 10 was due to retained stone).
(The amount of the leak to be 300 cc was chosen¹⁷).

Table 3: Distribution of grade of bile leak by mode of presentation.

Grade of Bile Leak	Mode of presentation	No. (n= 34)	Percentage (%)
High output	Peritonitis	2	5.8
	Drain	6	17.6
	Biloma	1	2.9
Low output	Peritonitis	6	17.6
	Drain	7	20.6
	Biloma	6	17.6
	Jaundice (main presentation)	5	14.7
	Cholangitis	1	2.9

BILE LEAK MANAGEMENT

Table 4: Distribution of site of injury by mode of presentation.

Site of Injury	Mode of presentation	No. (n= 34)	Percentage (%)
Cystic duct. Low grade. Strasberg A	Peritonitis	6	17.6
	Drain	1	2.9
	Biloma	6	17.6
	Jaundice, cholangitis	6	17.6
Major duct injury: Strasberg D. High grade.	Peritonitis	2	5.8
	Drain	6	17.6
Major duct injury: Strasberg E1. High grade.	Biloma	1	2.9
Major duct injury. Strasberg D. Low grade.	Drain	3	8.8
Liver bed, duct of Luschka. Low grade. Strasberg A	Drain	3	8.8

(Injury to duct of Luschka was selected when we had no clear leakage site other than collection of bile near the liver bed and they managed with conservatively only with drain follow up). (The median hospital stays were 10 days).

Table 5: Management options by site of injury and mode of presentation.

Management option	Site of Injury	Mode of presentation	No. (n= 34)	Percentage (%)
Conservative	Cystic duct low output	Biloma	3	8.8
		External biliary fistula	1	2.9
	Liver bed, duct of Lushcka Low output	External biliary fistula	4	11.8
ERCP Sphincterotomy plus stent	Cystic duct Low output	Peritonitis	6	17.7
		Jaundice, cholangitis	6	17.6
	Major duct High output	Peritonitis	2	5.8
		External biliary fistula	6	17.6
	Major duct injury Low output	External biliary fistula	2	5.8
ERCP Sphincterotomy alone	Cystic duct Low output	Biloma	2	5.8
Surgical Hepaticojejunostomy	Cystic duct Low output	Biloma, failure to cannulate.	1	2.9
	Major duct Strasberg E1	Biloma	1	2.9

(Cystic duct fistula was operated due to lower CBD obstruction because of chronic inflammations and failure to cannulate)

Table 6: Complications.

Complication	No. (n= 34)	Percentage (%)
No complication	28	82.4
Pancreatitis	1	2.9
Wound infection from PD catheter site	3	8.8
DVT	2	5.9

DISCUSSION:

In our study, we had 23.5% (8) males, 76.5% (26) females, with the mean age of 42.13. The same age group was noticed with Huang et al⁽¹¹⁾ and in Canena et al⁽¹²⁾ This shows the majority of patients were females in both developing and developed countries.

What we can find in a study by Chinnery et al⁽¹³⁾ 66.4% of biliary leaks resulting from cystic duct stump leaks. While in our study the site of bile leak was determined to be in 55.9% (19) from the cystic duct. CBD injuries were higher in our practice.

We could manage 23.5% (8) patients with only percutaneous drainage successfully. While Tantia et al⁽¹⁴⁾ reported failure in conservative treatment alone.

Surgical management was done for two patients. One was due to the impossible cannulation of the ampulla, the other patient had complete transection of the CBD, so surgical reconstruction done after 10 weeks post laparoscopic cholecystectomy. In a study done by Al Hajjar et al⁽¹⁵⁾, They performed an early repair (within 2 weeks from the time of injury) in 17 patients (47.22%) provided that there was no biliary peritonitis or acute cholangitis. Late repair (more than two weeks from injury) was performed in 19 patients (52.78%).

Two cases (5.8%) with sphincterotomy alone, who were selectively elected for the low-grade cystic duct leaks with no stones retained with 100% success rate while 64.7% (22) patients were managed with sphincterotomy plus stent. Stent alone was not practiced ever.

Likewise, in a study by Sandha et al⁽¹⁶⁾. Seventy-five patients 36% with low-grade leaks were treated with sphincterotomy alone with a 97% success rate. Ninety-seven patients 48% with high-grade leaks were stented with or without sphincterotomy with a 100% successful closure rate. We could use sphincterotomy alone more often.

CONCLUSION:

- Some patients with bile leak can be managed using conservative measures alone.
- Sphincterotomy alone can be used in low grade leaks, from cystic duct when there were no retained stones.
- High grade, major duct injuries is best managed (in term of faster healing) with sphincterotomy plus stenting to enhance healing.

REFERENCES:

1. Shawhan RR, Porta CR, Bingham JR, McVay DP, Nelson DW, Causey MW, et al. Biliary leak rates after cholecystectomy and intraoperative cholangiogram in surgical residency. *Military medicine*. 2015 May 1;180(5):565-9.
2. Mortensen FV, Jepsen P, Tarone RE, Funch-Jensen P, Jensen LS, Sørensen HT. Endoscopic sphincterotomy and long-term risk of cholangiocarcinoma: a population-based follow-up study. *J Natl Cancer Inst*. 2008; 100:745–50.
3. Strömberg C, Luo J, Enochsson L, Arnelo U, Nilsson M. Endoscopic sphincterotomy and risk of malignancy in the bile ducts, liver, and pancreas. *Clin Gastroenterol Hepatol*. 2008; 6:1049–53.
4. Mavrogiannis C, Liatsos C, Papanikolaou IS, Karagiannis S, Galanis P, Romanos A. Biliary stenting alone versus biliary stenting plus sphincterotomy for the treatment of post-laparoscopic cholecystectomy biliary leaks: a prospective randomized study. *European journal of gastroenterology & hepatology*. 2006 ;18:405-9.
5. Simmons DT, Petersen BT, Gostout CJ, Levy MJ, Topazian MD, Baron TH. Risk of pancreatitis following endoscopically placed large-bore plastic biliary stents with and without biliary sphincterotomy for management of postoperative bile leaks. *Surg Endosc*.2008;22:1459–63.
6. Hall JG, Pappas TN. Current management of biliary strictures. *J Gastrointest Surg*. 2004; 8:1098–1110.
7. Connor S, Garden OJ. Bile duct injury in the era of laparoscopic cholecystectomy. *Br J Surg*. 2006; 93:158–168.
8. Ahrendt SA, Pitt HA. Surgical therapy of iatrogenic lesions of biliary tract. *World J Surg*. 2001; 25:1360–1365.
9. Chaudhary A, Chandra A, Negi SS, Sachdev A. Reoperative surgery for postcholecystectomy bile duct injuries. *Dig Surg*. 2002; 19:22–27.
10. Chun K. Recent classifications of the common bile duct injury. *Korean journal of hepatobiliary-pancreatic surgery*. 2014 Aug 1;18(3):69-72.

BILE LEAK MANAGEMENT

11. Huang, Q., Yao, H. H., Shao, F., Wang, C., Hu, Y. G., Hu, S., et al. Analysis of Risk Factors for Postoperative Complication of Repair of Bile Duct Injury After Laparoscopic Cholecystectomy. *Digestive Diseases and Sciences*, 59(12), 3085–3091 (2014).
12. Canena J, Hortal D, Coimbra J, Meireles L, Russo P, Marques I, et al, Outcomes of endoscopic management of primary and refractory post cholecystectomy biliary leaks in a multicenter review of 178 patients. Department of Gastroenterology, Doutor Fernando Fonseca Hospital, IC 19, 2720-276 Amadora, Portugal, 2015
13. Chinnery G E, Bornma P C, Bernon M M, Hofmeyr S, Burmeister S, Endoscopic management of bile leaks after laparoscopic cholecystectomy, *S Afr J Surg* ;51(4):116-121. /SAJS.1829, Vol. 51 No. 4 November 2013
14. Tania O, Jain M, Khanna S, Sen B. Iatrogenic biliary injury: 13,305 cholecystectomies experienced by a single surgical team over more than 13 years. *Surgical endoscopy*. 2008 1;22:1077-86.
15. Al Hajjar, C. Tomuæ, L. Mocan T. Mocan, F. Graur, C. Iancu, et al. Management of Bile Duct Injuries Following Laparoscopic Cholecystectomy: Long-term Outcome and Risk Factors Influencing Biliary Reconstruction, *Chirurgia* 2014;109: 493-4;99.
16. 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;60:567-74. [[http://dx.doi.org/10.1016/S0016-5107\(04\)01892-9](http://dx.doi.org/10.1016/S0016-5107(04)01892-9)].
17. Approach to a Patient with Post Laparoscopic Cholecystectomy Bile Leak Prosanta Kumar Bhattacharjee* Department of Surgery, I.P.G.M.E and R/S.S.K.M Hospital, Kolkata, West Bengal, India.