



Surgical Management of Post Cholecystectomy Bile Duct Injuries

Dr. Haythem Abdul Shakoor ¹, Dr. Asma Anwar ^{*2}

1. *Consultant General Surgeon.*
2. *Post graduate trainee, General Surgery.*

***Correspondence to:** Dr. Asma Anwar. Post graduate trainee, General Surgery.

Copyright.

© 2026 **Dr. Asma Anwar**, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received: 07 January 2026

Published: 01 February 2026

DOI: <https://doi.org/10.5281/zenodo.18437530>

Abstract

Background: Due to the complex nature and diversity of bile duct injury (BDI) controversy exists regarding the best management plan of BDIs and sometimes this problem may be difficult to be managed even in the hands of an experience surgeon. The goal of our study is to evaluate the various techniques used for the management of bile duct injuries in our setup (HAYAT ABAD MEDICAL COMPLEX, KPK, PAKISTAN).

Material and Methods: A total of 25 patients were included in this single centered prospective cohort study for the evaluation of various techniques used in our setup (HAYAT ABAD MEDICAL COMPLEX, KPK, PAKISTAN) for appropriate management of BDIs, over a period of 5 years from January 2016 to December 2020.

Results: A total of 25 patients were included in this study out of which 7(28%) were male and 18 (72%) were female. Age range was 15-70 years with a mean age of (42 year). CBD injury occurred in 17(68%) patients after open and 8(32%) after laparoscopic cholecystectomy. Majority of the patients presented with obstructive jaundice (76%) and bile leak (16%) other presentation (biliary peritonitis, biloma, cholangitis etc were 8%). Out of 25 most patients 14(56%) had type E injuries and underwent Roux-en-y hepaticojejunostomy. No patient presented with major bile leak or disruption of anastomosis, minor leak occurred in 4 (16%), wound infection in 6(24%), bleeding in 1 (4%), pulmonary embolism in 1 (4%).

Conclusion: For BDIs related biliary strictures adequate biliary reconstruction and Roux-en-y hepaticojejunostomy can produce satisfactory results depending on Strasberg classification and bile duct status.

Key Words: Reconstruction, Roux-En-Y Hepaticojejunostomy, Bile Duct Injuries, Biliary Stricture.

Introduction

Bile duct injury (BDI) is one of the most serious surgical complication of biliary system that has a considerable impact on patient's mortality and morbidity[1,6]. It also possesses an influence on patient's quality of life with higher management cost and medicolegal issues along with death of patient.

The severity of BDI ranges from relatively simple leakage from the cystic duct stump or Gall bladder fossa on the liver surface to complete transection of biliary channels, ligation or even resection of one or more bile ducts. Sometimes these biliary injuries are accompanied by vascular injuries, mainly involving the right hepatic artery and right portal vein, stricture formation may also result in the long term. [2-12]

These complications may result after a variety of abdominal surgeries i.e. cholecystectomy, gastrectomy, liver surgeries, common bile duct (CBD) exploration, surgeries on the pancreas[3]. Most of the injuries of the CBD are due to cholecystectomy with laparoscopic cholecystectomy(LC) having twice the complication rate as compared to open cholecystectomy(OC) 0.4-0.6% vs 0.1-0.2% respectively^{3,5} currently 80%-85% of BDI are caused in laparoscopic cholecystectomy.[3]

Laparoscopic cholecystectomy is the treatment modality of choice for symptomatic gall stones. Initially, there was a surge In-the complication rate associated with LC >2%[2]. Despite the slow curve of learning, the incidence of BDI associated with laparoscopic cholecystectomy has now fallen to 0.5%[3,5,14],. But still high as compared to OC⁶-

The complications associated with cholecystectomy may be related to different factors including experience of the operating surgeon and patient factors (inflamed gall bladder, previous attacks of cholecystitis, thick-walled gall bladder, previous endoscopic procedures, male gender and anatomical variations) all are indicators of difficult cholecystectomy, causing difficulty in tissue dissection and identification of important structures.[7]

1. In order to minimize bile duct injuries in laparoscopic cholecystectomy
2. Different techniques have been Advised.
3. The critical view of safety technique is one of them which includes⁸ ;
 - Removing fats and fibrofatty tissue from the hepato-cystic triangle.
 - The lower part of the gall bladder should be taken off the cystic plate.
 - Only 2 structures should enter the gall bladder.

The Society of American Gastrointestinal Endoscopic Surgeons (SAGES) advise the 5 steps in a safe LC[9]

1. Establishing critical view of safety CVS
2. Understanding of relevant anatomy
3. Appropriate retraction/exposure
4. Knowing when to call for help;

Recognizing the need for conversion or an alternate procedure (such as subtotal cholecystectomy/ open surgery, stopping the procedure) is an alternative guide for safe surgery.

Per operative cholangiography can significantly reduce these devastating complications[10,11] as only 15% of complication are identified intra operatively remaining 85% of cases reveals itself post operatively by increasing levels of bilirubin, continuous bile drainage if a drain is placed in the area of surgery or biliary peritonitis if no such drain is provided[12].

The clinical suspicion of bile duct injuries can be investigated by different modalities that include ultrasonography, liver function tests, magnetic resonance cholangiography (MRCP the most sensitive and accurate)[2], and Endoscopic retrograde Cholangiopancreatography (ERCP)[5] and percutaneous Cholangiopancreatography (PTC)^{II}. The treatment of patients with BDI is often highly individualized based upon the type of injury, time since injury, co-morbidities and clinical status of patient e.g presence of sepsis and peritonitis [13] a multidisciplinary approach that involves hepato-pancreaticobiliary surgeon, gastroenterologist and interventional radiologist should be followed. Various classification systems are designed for delineating the type and extent of BDI with the Strasberg-Bismuth being widely accepted[13].

Type	Description
	Bile leak from the cystic duct or small ducts in the liver bed
B	Occlusion of an aberrant right hepatic duct
c	Transection without ligation of an aberrant right hepatic duct
D	Lateral injury to a major bile duct
E	Circumferential injury to a major bile duct:
	E1: Transection or stricture >2 cm from the hilum. E2: Transection or stricture < 2cm from the hilum. E3: Transection at the level of bifurcation, without loss of contact between the left and right hepatic ducts. E4: Transection at the level of bifurcation, with loss of contact between the left and right hepatic ducts E5: An injury to the right segmental duct combined with E3 or E4 injury

Table 1

Managements of BDI require utmost level of care, the aim (rationale) of our study is to find out and timely treat the patients presented with post cholecystectomy biliary injury an adequate reconstructive procedure and to reduce mortality and morbidity along with minimizing the devastating effects of BDI on patient quality of life.

Material and Methods

This prospective cohort study was conducted on 25 patients in the general surgical department of Hayatabad Medical Complex, Peshawar, KPK from January 2016 to December 2020, after approval from the ethical committee and taking informed consent from the patient.

After receiving patients detailed history was taken, all the previous record perused, and physical examination was performed. Patients were investigated with IHS, Ultrasonography, MRCP and ERCP, PTC, along with other supportive investigations and consultation with gastroenterology.

Inclusion Criteria

1. All patient presented with BDI.
2. Age range 15 to 70 years.
3. Both genders

Exclusion Criteria

1. ASA-IV (patient not fit for general anesthesia)
2. Patients with active wound infection.
3. CBD stricture due to malignant causes.
4. Age <15 years.
5. Biliary injury managed by Gastro unit through ERCP prognosis of the patient is dependent on patient physical fitness and co-morbidities, type of BDI, time since injury, surgeon expertise and availability of advanced facilities.

The type of surgical procedure performed was based upon pre-operative and intraoperative assessment and the type of bile duct injury along with the choice of surgeon, based upon his personal experience and current guidelines for BDI management.

Results

A total of 25 patients were included in the study having age range between 15-70 with a mean age of 42 years. Among 25 patients 7 (28%) were male and 18 (72%) were female. For the patients that presented to our setup, the type of previous surgeries, type of Strasberg-Bismuth injuries and procedure done in our setup are given in (table 2). Majority of the patient presented within the first 2 weeks of surgery, the main presentation were jaundice 19 (76%), bile leaks 4 (16%) and others (biliary peritonitis, biloma, cholangitis etc were 2 (8%).

S. No	Previous surgery (No of Pts with %)	Strasberg- Bismuth	No. of Injury patients	Procedure done
01	Open cholecystectomy 17 (68%)	Type E1 Type E2 Type E3 Type E4	8 2 3 3 1	primary repair of CBD Patients with type E-Strasberg injury underwent Roux-en-Y hepaticojejunostomy
02	Laparoscopic cholecystectomy 8 (32%)	Type D Type E1 Type E Type E4	3 2 2 1	primary repair of CBD Patients with type E-Strasberg injury underwent Roux-en-Y hepaticojejunostomy

Table 02

S. No	Complication No.	No. of patients with percentage
1	Local Bleeding Wound infection Biliary leak Pancreatitis	4(16%) 1(4%)
2	Systemic Chest infection Pulmonary embolism	4(16%) 1(4%)

Table 03 Frequency of complication (after biliary reconstruction)

Discussion

Cholecystectomy is one of the most commonly performed procedure and laparoscopic approach is now the gold standard for symptomatic gall stone. In spite of great advances in surgery, bile duct injury is still a common complication having devastating effects on patients quality of life. It requires proper assessment, identification of the type of injury, early intervention and proper management to maintain biliary continuity and functional integrity.

Open cholecystectomy is still commonly being performed in Pakistan and the majority of patients included in our study had undergone open surgery in the periphery or referred cases from Afghanistan. This is because of the lack of laparoscopic cholecystectomy facilities/ expertise in the periphery hospitals. However data shows that BDI is more common in LC as compared to OC. Sahajpal et al reported BDI rate for OC to be 0.2% vs 0.4% to 0.6% with LC. [14]

The majority of patient in our study had Bismuth type E injuries 14 (56%) These patients were managed by Roux-en-y hepaticojejunostomy which currently the most practiced reconstructive procedure for maintaining biliary continuity[15]. Type D injuries occurred in 11(44%) of cases and were treated with primary repair over T-tube or biliary stent placed during ERCP. This is in comparison with other studie16 in which equal number of patient underwent primary repair of CBD vs Roux-en-y hepaticojejunostomy.

Both local and systemic complications occurred in this study. Wound infection was the most common local complication 6(24%) cases. Minor biliary leak occurred in patients. No major bile leak or disruption of anastomosis were observed. Bleeding was noted in one patient (4%) from entero-enterostomy site for which re-exploration was done and entero-enterostomy reconstructed after evacuation of the haematoma. In a study conducted by zafar et al the wound infection was 23% and biliary leak was 10%17 Systemic complications were also noted in this study all of them were conservatively managed. One patient developed pulmonary embolism at 4th post-operative day. Chest infection noted in4(16%) of the patients. No mortality noted in our study.

Limitation

Majority of the patients in our study had open cholecystectomy as compared to Laparoscopic surgery. Most of the data available on BDIs in the literature is on BDI after LC.

Concuision

For BDI related biliary strictures adequate biliary reconstruction and Roux -en-y hepaticojejunostomy can produce satisfactory results depending on Strasberg-classification and bile duct status.

References

1. De Reuver PR, Sprangers MA, Rauws EA, Lameris JS, Busch OR, Van Gulik TM, Gouma DJ. Impact of bile duct injury after laparoscopic cholecystectomy on quality of life: a longitudinal study after multidisciplinary treatment. *Endoscopy*. 2008
2. Hadi A, Aman Z, Khan SA, Zafar H, Khan M, Afridi SK, Iqbal Z. Surgical management of bile duct injuries following open or laparoscopic cholecystectomy. *J Pak Med Assoc*. 2013 Aug
3. Mercado MA, Dominguez I. Classification and management of bile duct injuries. *World journal of gastrointestinal surgery*. 2011 Apr
4. NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic cholecystectomy the new 'gold standard'?. *Archives of surgery*. 1992 Aug
5. sicklick JR, Camp MS, Lillemoe KD, Melton GB, Yeo CJ, Campbell KA, Talamini MA, Pitt I-IA, Coleman J, Sauter PA, Cameron JL. Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. *Annals of surgery*. 2005 May;241(5):786
6. Krähenbühl L, Sclabas G, Wente MN, Schäfer M, Schlumpf R, Büchler MW. al Incidence, risk factors, and prevention of biliary tract injuries during laparoscopic cholecystectomy in Switzerland. *World journal of surgery*. 2001 30.
7. Richardson MC, Bell G, Fullarton GM. Incidence and nature of bile duct injuries following laparoscopic cholecystectomy: an audit of 5913 cases. *Journal of British Surgery*. 1996 Oct;83(10):1356-60.
8. Kaya B, Fersahoglu MM, Kilic F, Onur E, Memisoglu K. Importance of critical view of safety in laparoscopic cholecystectomy: a survey of 120 serial patients, with no incidence of complications. *Annals of hepato-biliary-pancreatic surgery*. 2017 Feb
9. Renz BW, Bösch F, Angele MK. Bile duct injury after cholecystectomy: surgical therapy. *Visceral medicine*.

10. Caratozzolo E, Massani M, Recordare A, Bonariol L, Antoniutti M, Jelmoni A, Bassi N. Usefulness of both operative cholangiography and conversion to decrease major bile duct injuries during laparoscopic cholecystectomy. *Journal of hepato-biliary-pancreatic surgery*. 2004 Jun
11. Okuda K, Tanikawa K, Emura T, Kuratomi S, Jinnouchi S, Urabe K, Sumikoshi T, Kanda Y, Fukuyama Y, Musha H, Mori H. Nonsurgical, percutaneous transhepatic cholangiography—diagnostic significance in medical problems of the liver. *The American journal of digestive diseases*. 1974 Jan 1;19(1):21-36.
12. Williams N S, O'Connell P R, McCaskie A(eds). *Bailey &love's Short Practice of Surgery*. 27th ed. London: Chapman &Hall Medical. 2018
13. Schreuder AM, Busch OR, Besselink MG, Ignatavicius P, Gulbinas A, Barauskas G, Gouma DJ, van Gulik TM. Long-term impact of iatrogenic bile duct injury. *Digestive surgery*. 2020;37(1):10-21.
14. sahajpal AK, Chow SC, Dixon E, Greig PD, Gallinger S, Wei ACO Bile duct injuries associated with laparoscopic cholecystectomy: timing of repair and long-term outcomes. *Archives of Surgery*. 2010 Aug
15. Kukar M, Wilkinson N. Surgical management of bile duct strictures. *Indian Journal of Surgery*. 2015 Apr;77(2):125-32.
16. Khalaf AM. Management of bile duct injuries: comparative study between Rouxen-Y hepaticojejunostomy and primary repair with stent placement. *Journal of The Arab Society for Medical Research*. 2013 Jul 1;8(2):89.
17. Zafar SN, Khan MR, Raza R, Khan MN, Kasi M, Rafiq A, Jamy OH. Early complications after biliary enteric anastomosis for benign diseases: a retrospective analysis. *BMC surgery*. 2011 Dec;11(1):1-5.



Medtronic