Journal of Surgery
[Jurnalul de Chirurgie]
Research Article Open Access

Bile Duct Injury - Parameters and Indicators for a Successful Outcome: A Study of 17 Cases

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Abstract

Bile duct injury is a known devastating complication following surgery upon the biliary tract; most commonly occurring after cholecystectomy. The injuries are more severe following laparoscopic cholecystectomy than open cholecystectomy. Various classifications are used to describe the different types of bile duct injury; Bismuth, Strassbourg, Brisbane are some of them. More proximal the injury more challenging it is for the surgeon to treat with poor outcomes. Biliary sepsis is a dangerous development, which adds to the morbidity and mortality of the patient. Surgical intervention is done when the sepsis is controlled; the patient is stable and fit for surgery. Roux-en-Y hepaticojejunostomy is the surgery of choice in most cases.

There were 10 females and 7 males in this series. The age group varied from 28 years to 61 years old. 14 patients were operated upon. Three patients were in biliary sepsis with MODS and could not be operated. Various indicators like P^H, PT/INR, serum proteins, serum lactate were assessed in predicting the outcome of these patients.

Keywords: Laparoscopic cholecystectomy; sepsis; Multi-organ failure; Bile duct injury

Introduction

Bile duct injury is a known devastating complication following surgery upon the biliary tract; most commonly occurring after cholecystectomy. The injuries are more severe following laparoscopic cholecystectomy than open cholecystectomy. Various classifications are used to describe the different types of bile duct injury; Bismuth, Strassbourg, Brisbane are some of them. More proximal the injury more challenging it is for the surgeon to treat with poor outcomes. Biliary sepsis is a dangerous development, which adds to the morbidity and mortality of the patient. Surgical intervention is done when the sepsis is controlled; the patient is stable and fit for surgery. Roux-en-Y hepaticojejunostomy is the surgery of choice in most cases.

17 cases treated for bile duct injury from 2010 until 2018 in Tata Main Hospital, Jamshedpur. 15 cases referred to us from other centres.

Materials and Methods

There were 10 females and 7 males in this series (Figure 1). The age group varied from 28 years to 61 years (Figure 2). The median age was 42 years. 4 patients had Bismuth Type 1 injury, 12 patients had Bismuth Type 2 injury and 1 patient had Bismuth Type 4 injury (Figure 3).

Patients were referred to us ranging from 2 days to 8 days following the primary surgery. All these patients underwent the following investigations (Table Ia and Table Ib)

1. Complete blood picture with haematocrit
2. Serum LFT, PT/INR, Serum proteins with Alb/Glob ratio
3. Random blood glucose and Serum Creatinine
4. Serum Electrolytes
5. Blood culture where biliary sepsis was suspected
6. Ultrasound of the abdomen to detect bilioma and collections
7. MRCP
8. Arterial blood gas
9. Chest X ray.

USG guided bilioma drainage was done in 13 cases.

Laparotomy with Roux-en-Y hepaticojejunostomy was done in 14 cases.

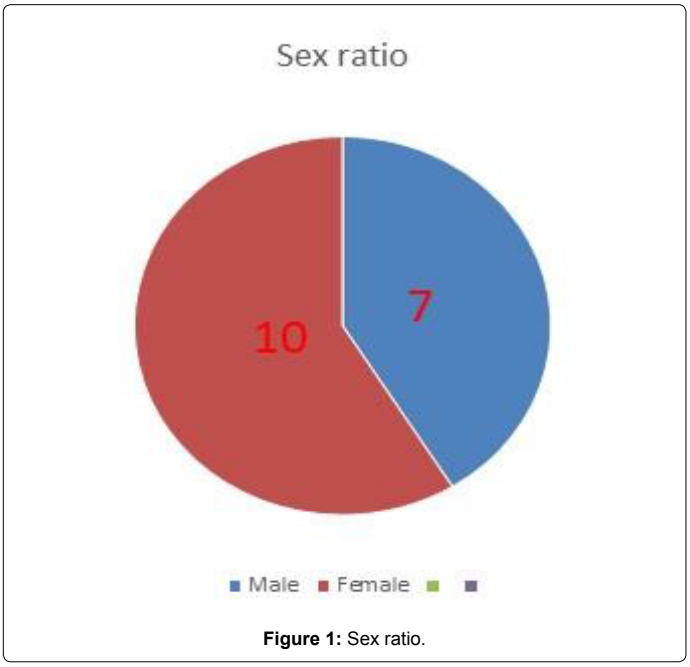

Figure 1: Sex ratio.

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Received June 07, 2018; **Accepted** June 19, 2018; **Published** June 26, 2018

Citation: Chattoraj A, Kundu N. Bile Duct Injury - Parameters and Indicators for a Successful Outcome: A Study of 17 Cases. Journal of Surgery [Jurnalul de chirurgie]. 2018; 14(3): 109-112 DOI: 10.7438/1584-9341-14-3-4

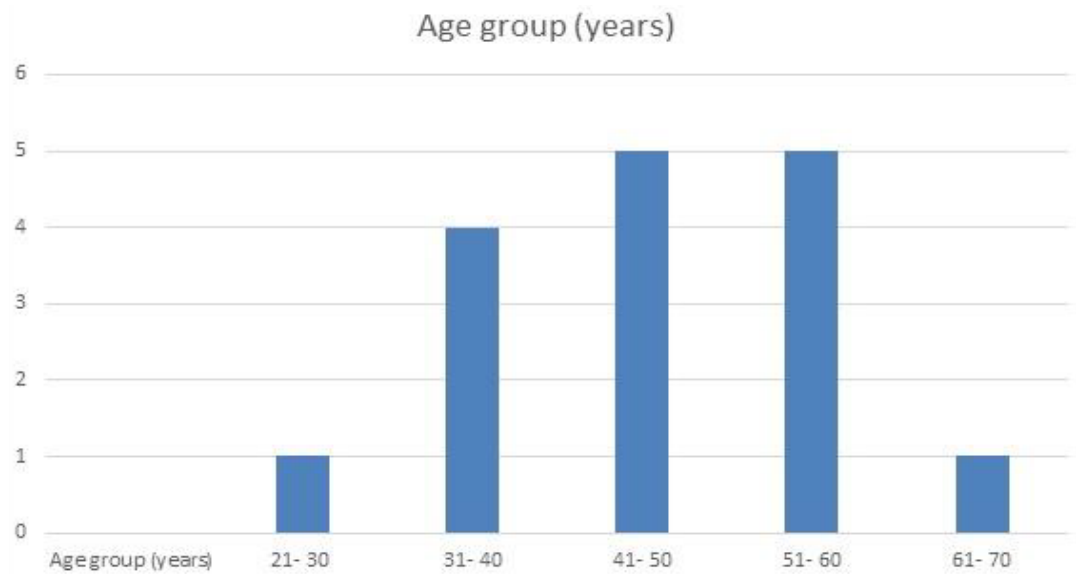

Figure 2: Age group (years).

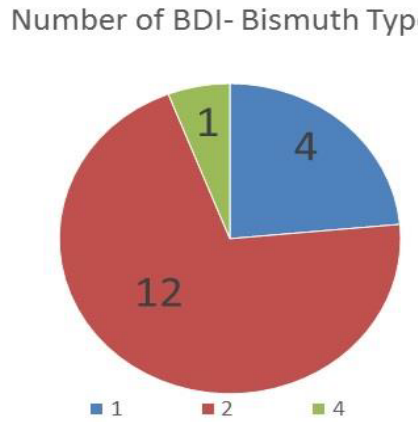

Figure 3: Number of BDI-Bismuth types.

Table Ia: Biological parameters.

No.	Hb%	TLC	S. Bil	ALP	RBG	Creatinine	Alb	PT/INR	P^H
1	9.4	14600	5.6	860	133	1.2	2.8	1.8	7.31
2	8.6	16300	6	760	115	2.0	2.2	2.1	7.2
3	9.8	12800	3.4	478	118	0.9	3.2	1.6	7.3
4	10	12800	3.2	450	120	1.2	3.4	1.4	7.4
5	9.8	12400	3.2	480	126	0.8	3.2	1.4	7.32
6	9.0	15400	4.2	480	126	1.8	2.6	1.2	7.26
7	9.6	13300	4.4	520	130	1.2	3	1.4	7.34
8	8.6	22000	5.6	600	320	2.8	2.0	2.2	7.1
9	9.6	13200	3.8	520	145	0.9	3.2	1.2	7.34
10	8.2	14400	5.4	670	130	1.3	1.8	2	7.2
11	9.4	15500	4.6	560	145	1.3	2.4	1.8	7.26
12	7.2	26000	5.8	700	152	3.0	1.8	2.2	7.1

Observations

Two cases of BDI, which occurred in our hospital, were diagnosed during the primary laparoscopic cholecystectomy and were immediately converted to Roux-en-Y hepaticojejunostomy. Both patients had Mirizzi's type 2 disease and during the gall bladder dissection there was bile duct injury-Bismuth Type 1. Both patients recovered well and discharged.

The remaining 12 cases were from other centres and had altered CBC, serum LFT, PT/INR and low serum albumin. Serum creatinine was deranged in four cases, which improved during treatment. None of them needed haemodialysis.

The patients were treated with Inj. Piperacillin+Tazobactam 4.5 Gm/Inj. Meropenem 1 Gm, Inj. Metronidazole, TPN with IV amino acid

Table Ib: Biological parameters followed after surgery.

No.	Lactate	HCO_3	Na	K	Cl
1	2.5	18	122	3.3	112
2	4	15	130	3.8	114
3	1.4	22	132	4.2	112
4	1	25	134	4.2	112
5	2	20	134	3.8	116
6	2.6	16	130	3.4	112
7	1.2	25	134	4.2	112
8	3.4	18	130	3.4	114
9	1	23	132	4.2	114
10	2.4	16	128	3.1	106
11	2.2	18	132	3.4	114
12	4	16	120	3.1	106

solutions and 25% dextrose. Oral glucose powder 100 Gm daily was given to those who were not diabetics. Packed cell and FFP transfusion was given where required. In those patients having fever not responding to antibiotics or showing deterioration despite adequate antibiotic coverage repeat blood and urine cultures were sent. Blood culture was positive for *E. coli* in only one patient. Urine cultures were sterile in all the cases. 3 patients could not be operated upon since they developed severe biliary sepsis with ARDS needing full ventilatory support with a FIO2 ranging from 0.7 to 1, along with septic shock needing inotropes, haemodialysis for oliguria. They had severe metabolic acidosis with the P^H ranging from 6.9 to 7.1. These three patients succumbed during treatment after 5 days. They were being treated with Inj. Meropenem 1 Gm IV 8 hourly along with Colistin, Metronidazole and IV Fluconazole. TPN was given to all the three patients.

All the patients were operated only when the sepsis was controlled, nutrition had improved and was in a stable condition. The albumin and PT/INR were monitored to improve them to normal levels. They were operated between 2 and 4 weeks of the BDI.

Roux-en-Y hepaticojejunostomy was done in all the cases. The anastomosis was done using 3-0 PDS (Figure 4).

Eight patients developed superficial wound infection which settled on antibiotics and dressing. 2 patients had a post-operative bile drain of >200 mL/day for 5 days which then gradually reduced and healed.

Of the 14 patients 5 had come within 3 days of injury, 5 had come within 7 days of injury and 4 had come on the 12th day of injury.

The following observations were made in this study-

1. Those patients who were referred early (within 3 days of BDI) recovered faster and better than those who came on the 12th day of BDI.
2. Patients with metabolic acidosis took a mean of 12 days to recover following the Roux-en-Y hepaticojejunostomy while those with normal/near normal P^H recovered within 7 days of Roux-en-Y hepaticojejunostomy. They needed higher antibiotics and elective ventilation till the acidosis settled.
3. Patients with altered serum albumin and PT/INR also had a recovery time of 12 days compared to those patients with a near normal albumin and PT/INR levels.
4. Aggressive treatment of sepsis needs to be done by drainage of bilioma along with broad-spectrum antibiotics. Nutrition of these patients is paramount.
5. Patients with fever, metabolic acidosis, on ventilator fared poorly as compared to the other patients.

There is a direct relation of recovery of the patients with level of metabolic acidosis, hypoalbuminemia, and altered coagulation profile. There is no direct correlation with level of serum bilirubin, alkaline phosphatase with the outcome of these patients.

Discussion

A major challenge for all surgeons remains bile duct injury following cholecystectomy-both open and laparoscopic. Severe injuries such as bile duct transection or recurrent strictures need experienced surgeons capable of performing reconstructive surgery. Surgical repair can be complicated by biliary leak, sepsis, cholangitis, bleeding, anastomotic strictures and biliary cirrhosis with portal hypertension and end-stage liver disease. It is well known that bile duct injuries lead to prolonged morbidity, high costs, and an impaired quality of life [1-3]. Optimization of the management strategy can reduce these complications.

This article describes a consecutive series of 17 patients undergoing reconstructive surgery; Roux-en-Y hepaticojejunostomy for bile duct injury operated at our institution over 8 years. We analysed various conditions and predictors influencing the occurrence of major complications and outcome in this study. The index cholecystectomy was performed by the laparoscopic method in all 17 cases. Of these two cases of bile duct injury occurred in our institution. As the incidence of BDIs is higher in laparoscopic cholecystectomy than open cholecystectomy (0.1-0.2% vs. 0.4-0.6%) and tends to be more severe the technique of index cholecystectomy may indirectly affect the outcome after surgical repair in these patients [4,5].
There were 11 patients above the age of 40 years. Older age was not associated with occurrence of major complications after surgical repair as noted in a few studies [6-10]. It is now established that following successful management, quality of life is decreased and survival impaired especially in elderly patients [11]. The injury was recognized intra-operatively in 02 cases (12%) similar to other studies where the majority of biliary injuries are not recognized during the initial cholecystectomy [9]. After diagnosing injury 15 of 17 patients (88%) were referred to our centre.

The Gold standard of treatment of bile duct injuries is Roux-en-Y hepatico-jejunostomy (HJ) and is the preferred method of repair. This was performed in all patients in this study. Repair in the presence of peritonitis is associated with poor outcome [12,13]. Our practice was to initially control sepsis via radiologic intervention or laparotomy/ laparoscopy and antibiotics and operate on patients later (2-4 weeks), after their index admission. This gives us time for the collections and inflammation to subside. The optimal timing of surgical repair remains controversial. Early surgical reconstruction performed several days to within 3 weeks after injury, on non-dilated bile ducts and inflamed tissues is thought more difficult with poorer short and long-term outcomes. However, many authors have failed to identify early repair as an individual risk factor [12,14,15]. In this series, early repair within 3 weeks was associated with the lowest incidence of major complications,

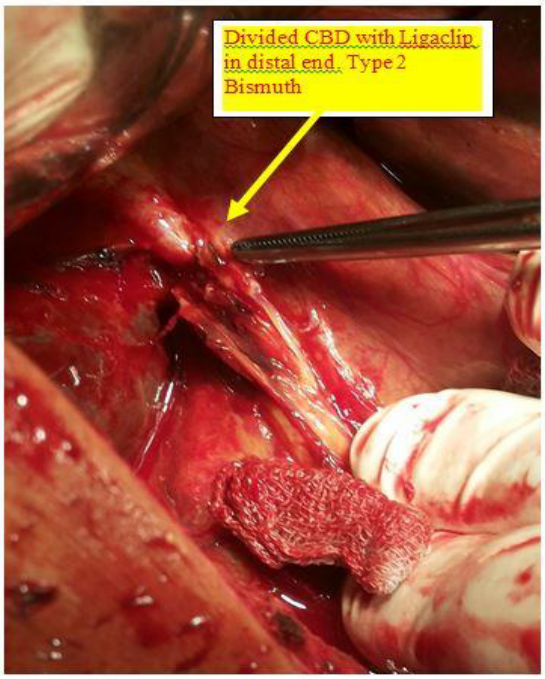

Figure 4: Divided CBD with Ligaclip in distal end. Type 2 Bismuth.

as reported in some other series also [16]. Patients with late repairs and repeat surgeries were associated with significantly higher incidence of major complications though timing of repair was not an independent predictor for outcome.

None of the patients in this series needed reoperation for failed repairs previously performed by a non-experienced surgeon. Reports suggest that 75% of primary surgeons attempt to repair the injury themselves [2]. Prior reconstructive surgery by the initial surgeon was found to be associated with an increased incidence of complications though it was not found to be an independent predictor in our series (02 patients). We feel that a surgeons experience and skill at managing this condition is an important factor affecting the outcome of the patient. Stewart and Way showed that the outcome of a surgical repair after BDI is successful in 94% of the patients if performed in a specialized center, whereas only 17% are successful when operated on by the initial surgeon [17]. A multicentre report by Woods et al. reported a similar rate of failure (94%) following repair prior to specialist referral [18]. In addition, the number of attempted repairs before referral was a significant predictor of poor outcome. Multiple attempts lead to a higher rate of failure and complications [19].

Other prognostic factors for successful repair of iatrogenic BDI include the level of injury and absence of injury to the right hepatic artery. It has long been recognized that higher the location of injury or stricture, the more difficult is the repair and the greater is the recurrence rate though we did not observe an association between level of injury and outcome, the relatively small number of patients within each injury sub-type makes it difficult to compare.

Stewart et al. reported that biliary injuries repaired by the primary surgeon are associated with a higher incidence of postoperative abscess bleeding, hemobilia, hepatic ischemia, and the need for hepatic resection but a similar increase in the complication rate was not seen in patients treated by hepatobiliary surgeons [20].

Conclusion

In conclusion, referral to a tertiary centre after therapeutic interventions was an independent negative predictor of outcome. Reconstructive surgery after repair performed by non-experienced surgeons had a worse outcome. Our findings thus support early referral of patients to a tertiary hepato-biliary center after bile duct injury without intervention and specialist surgical repair.

Conflict of Interest

Authors have no conflict of interest to disclose.

References

1. Kaman L, Behera A, Singh R, Katariya RN (2004) Management of major bile duct injuries after laparoscopic cholecystectomy. Surg Endosc 18: 1196-1199.
2. Flum DR, Cheadle A, Prela C, Dellinger EP, Chan L (2003) Bile duct injury during cholecystectomy and survival in medicare beneficiaries. JAMA 290: 2168-2173.
3. Boerma D, Rauws EA, Keulemans YC, Bergman JJ, Obertop H, et al. (2001) Impaired quality of life 5 years after bile duct injury during laparoscopic cholecystectomy: a prospective analysis. Ann Surg 234: 750-757.
4. Roslyn JJ, Binns GS, Hughes EF, Saunders-Kirkwood K, Zinner MJ (1993) Open cholecystectomy. A contemporary analysis of 42,474 patients. Ann Surg 218: 129-137.
5. Strasberg SM, Hertl M, Soper NJ (1995) An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg 180: 101-125.
6. Csendes A, Diaz C, Burdiles P, Nava O, Yarmuch J, et al. (1992) Indications and results of hepaticojejunostomy in benign strictures of the biliary tract. Hepatogastroenterology 39: 333-336.
7. Sutherland F, Launois B, Stanescu M, Campion JP, Spiliopoulos Y, et al. (1999) A refined approach to the repair of postcholecystectomy bile duct strictures. Arch Surg Chic Ill 134: 299-302.
8. Tocchi A, Costa G, Lepre L, Liotta G, Mazzoni G, et al. (1996) The long-term outcome of hepaticojejunostomy in the treatment of benign bile duct strictures. Ann Surg 224: 162-167.
9. Lillemoe KD, Martin SA, Cameron JL, Yeo CJ, Talamini MA, et al. (1997) Major bile duct injuries during laparoscopic cholecystectomy. Follow-up after combined surgical and radiologic management. Ann Surg 225: 459-468.
10. Fullum TM, Downing SR, Ortega G, Chang DC, Oyetunji TA, et al. (2013) Is laparoscopy a risk factor for bile duct injury during cholecystectomy? JSLS J Soc Laparoendosc Surg Soc Laparoendosc Surg 17: 365-370.
11. Moore DE, Feurer ID, Holzman MD, Wudel LJ, Strickland C, et al. (2004) Long-term detrimental effect of bile duct injury on health-related quality of life. Arch Surg 139: 476-482.
12. De Reuver PR, Grossmann I, Busch OR, Obertop H, van Gulik TM, et al. (2007) Referral pattern and timing of repair are risk factors for complications after reconstructive surgery for bile duct injury. Ann Surg 245: 763-770.
13. Schmidt SC, Langrehr JM, Hintze RE, Neuhaus P (2005) Long-term results and risk factors influencing outcome of major bile duct injuries following cholecystectomy. Br J Surg 92: 76-82.
14. Thomson BNJ, Parks RW, Madhavan KK, Wigmore SJ, Garden OJ (2006) Early specialist repair of biliary injury. Br J Surg 93: 216-220.
15. Sicklick JK, Camp MS, Lillemoe KD, Melton GB, Yeo CJ, et al. (2005) Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. Ann Surg 241: 786-792.
16. Perera MTPR, Silva MA, Hegab B, Muralidharan V, Bramhall SR, et al. (2011) Specialist early and immediate repair of post-laparoscopic cholecystectomy bile duct injuries is associated with an improved long-term outcome. Ann Surg 253: 553-560.
17. Stewart L, Way LW (1995) Bile duct injuries during laparoscopic cholecystectomy. Factors that influence the results of treatment. Arch Surg Chic Ill 1960. 130: 1123-1129.
18. Woods MS, Traverso LW, Kozarek RA, Tsao J, Rossi RL, et al. (1994) Characteristics of biliary tract complications during laparoscopic cholecystectomy: a multi-institutional study. Am J Surg 167: 27-34.
19. Pellegrini CA, Thomas MJ, Way LW (1984) Recurrent biliary stricture. Patterns of recurrence and outcome of surgical therapy. Am J Surg 147: 175-180.
20. Stewart L, Robinson TN, Lee CM, Liu K, Whang K, et al. (2004) Right hepatic artery injury associated with laparoscopic bile duct injury: incidence, mechanism, and consequences. J Gastrointest Surg Off J Soc Surg Aliment Tract 8: 523-530.