

Outcome of Early and Delayed Repair of Bile Duct Injury

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Abstract

Background: To assess outcome of early and delayed repair of bile duct injury. **Materials & Methods:** One hundred twelve patients age ranged 20-60 years of either gender with bile duct injury were divided into two groups. Group I were of early repair (acute (<48 hours from index procedure) and group II were of delayed repair (>48 hours after index procedure). In all patients, operative findings such as injury classification and procedural variables, mortality were recorded. **Results:** A non-significant difference was observed between parameters ($P > 0.05$). Etiology was cholecystectomy in 30 in group I and 25 in group II, non-biliary abdominal procedures 20 in group I and 22 in group II and abdominal trauma 6 in group I and 9 in group II. Strasburg-Bismuth classification E1 was seen maximally in both groups (24 in group I, 20 in group II), E2 (22 in group I, 28 in group II). **Conclusion:** There were equivalent outcomes for patients undergoing early and delayed repair of CBDI.

Keywords: Common bile duct injury, cholecystectomy, Early outcome, Delayed outcome

INTRODUCTION

Injury to the extrahepatic biliary tree is a well-described complication of cholecystectomy. Common bile duct injury (CBDI) remains a serious concern for patients and surgeons.^[1] Despite studies identifying patient and surgeon-related factors associated with CBDI including inflammation and conversion to open cholecystectomy, approximately 30% of CBDI are not identified during the index operation and may not be recognized until several days after the initial injury.^[2]

The incidence of BDI has risen from 0.2-0.4% for open cholecystectomy to 0.6-0.8% for LC, but the true rate still remains unknown.^[3] There seems to be a trend to more complicated

and proximal injuries (injury <2 cm from the bifurcation). It is known that misinterpretation of anatomy was cited by the majority (92.9%) of surgeons as the primary cause of bile duct injuries whereas 70.9% of surgeons cited a lack of experience as a contributing factor.^[4]

The early and accurate diagnosis of IBDI is very important for both patients and gastrointestinal surgeons because unrecognized IBDI leads to serious complications such as biliary cirrhosis, hepatic failure, and death.^[5] The choice of the appropriate treatment for IBDI is very important because it may avoid these serious complications and improve patients' quality of life. Therefore, the question regarding the timing and type of treatment of IBDI is still a

matter of debate. Endoscopic treatment is recommended in patients with IBDI. When endoscopic techniques are failed, different surgical reconstructions are performed to allow good bile flow to the alimentary tract.^[6]

Cystic duct stump leak, partial laceration of the common bile duct, or even small strictures can be managed by endoscopic retrograde or percutaneous stenting and dilation.^[7] The most severe lesions such as bile duct transection or recurrent strictures tend to require reconstructive surgery. Collaboration among surgeons, gastroenterologists, and interventional radiologists is imperative in the management of these complex injuries.^[8] Considering this, the present study aimed at assessing outcome of early and delayed repair of bile duct injury.

MATERIALS & METHODS

One hundred twelve patients age ranged 20-60 years of either gender with bile duct injury were selected. All enrolled patients were informed regarding the study and their written consent was obtained before starting the study. Institutional ethical review

committee approval was taken after obtaining patients consent.

Demographic data of each patient was noted down. Patients were divided into two groups based on the timing of definitive biliary repair or reconstruction. Group I were of early repair (acute (<48 hours from index procedure) and group II were of delayed repair (>48 hours after index procedure). In all patients, operative findings such as injury classification and procedural variables, mortality were recorded. CBDI type was recorded based on Strasberg Bismuth classification system.

Immediate intraoperative CBDI repairs were evaluated with intraoperative ultrasound (IOUS) for vasculobiliary injury (VBI). Parameters such as injury subtype, presence of vascular injury, chronic medical conditions, and intraoperative details of the biliary reconstruction surgery and hospital length of stay was recorded in both groups. Results of the present study after recording all relevant data were subjected for statistical inferences using chi-square test. The level of significance was significant if p value is below 0.05 and highly significant if it is less than 0.01.

RESULTS

Table 1: Age and gender distribution

Age groups (years)	Male	Female	Total
20-30	10	7	17
30-40	26	23	49
40-50	18	11	29
50-60	8	9	17
Total	62	50	112

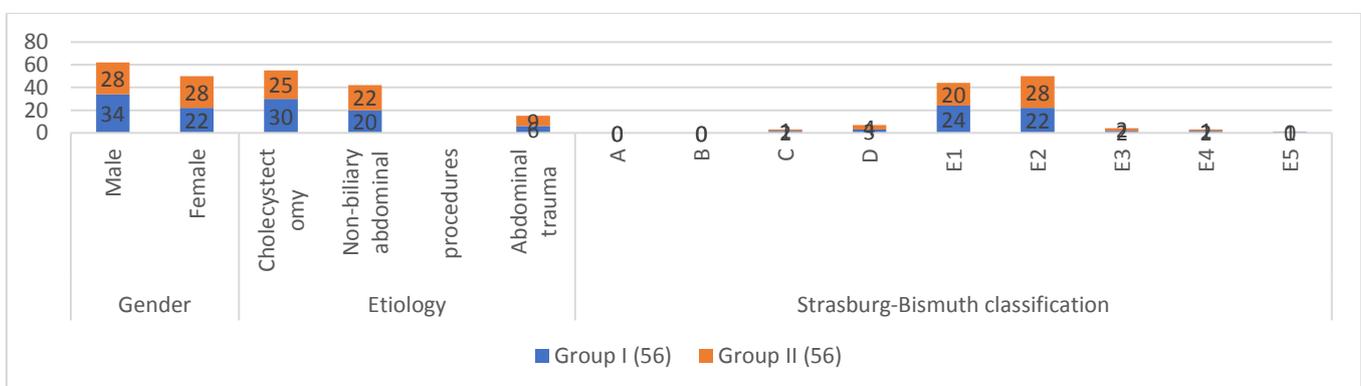
Maximum cases were seen in age group 30-40 years (males- 26, females- 23) followed by 40-50 years (males- 18, females- 11) (Table 1).

Table 2: Assessment of patients' variables

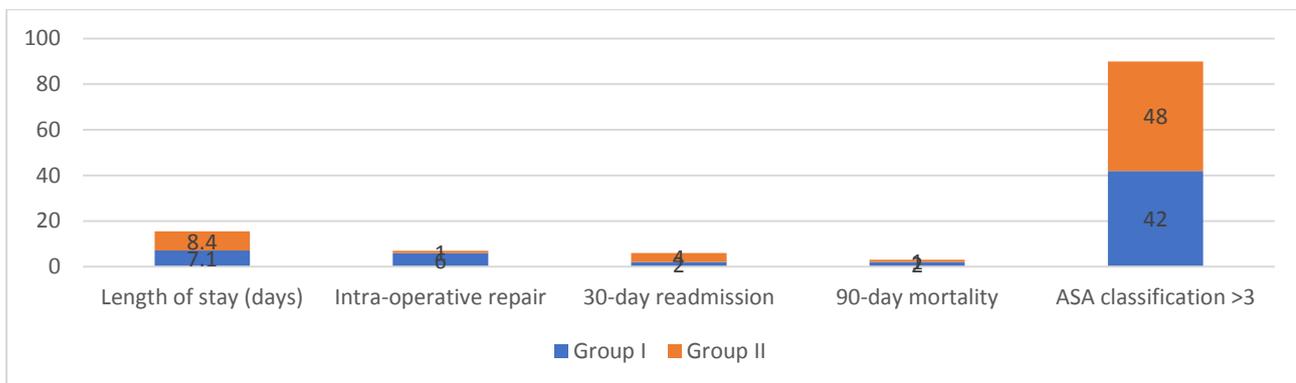
Parameters	Variables	Group I (56)	Group II (56)	P value
Gender	Male	34	28	>0.05
	Female	22	28	
Etiology	Cholecystectomy	30	25	<0.05
	Non-biliary abdominal procedures	20	22	
	Abdominal trauma	6	9	
Strasburg-Bismuth classification	A	0	0	<0.05
	B	0	0	
	C	2	1	
	D	3	4	
	E1	24	20	
	E2	22	28	
	E3	2	2	
	E4	2	1	
E5	1	0		
Length of stay (days)		7.1	8.4	>0.05
Intra-operative repair		6	1	<0.05
30-day readmission		2	4	>0.05
90-day mortality		2	1	>0.05
ASA classification >3		42	48	>0.05

There were 34 males and 22 females in group I and 28 males and 28 females in group II. Etiology was cholecystectomy in 30 in group I and 25 in group II, non-biliary abdominal procedures 20 in group I and 22 in group II and abdominal trauma 6 in group I and 9 in group II. Strasburg-Bismuth classification C was seen in 2 in group I and 1 in group II, D in 3 in group I and 4 in group II, E1 24 in group I and 20 in group II, E2 22 in group I and 28 in group II, E3 2 in group I and 2 in group II, E4 2 in group I and 1 in group II and E5 1 in group I. A non-significant difference was observed between parameters ($P > 0.05$) (Table 2, Graph 1, Graph 2).

Graph 1: Patients' variables



Graph 2: Patients' variables



DISCUSSION

Bile duct injury remains the most significant and one of the most feared complications after LC that frequently leads to litigation. Many factors lead to this complication, including misinterpretation of anatomy, normal or variant, thermal injury from electrocautery, extensive inflammation, short length of the cystic duct, hemorrhage and morbid obesity.^[9] Most of these injuries are not recognized intraoperatively, leading to BDI and consequent increased rates of morbidity and mortality due to severe episodes of cholangitis, jaundice, and intraabdominal sepsis.^[10] Sometimes the period between injury and definitive treatment is long enough to seriously impact on quality of life. Evidence suggests that these patients have a long history of high rates of admissions to hospitals until their final treatment.^[11]

The Strasberg-Bismuth injury classification system standardizes the anatomical description of biliary injuries with added descriptions of vasculobiliary injury (VBI) and extreme VBI, no injury description model describes the optimal time for repair of injury based on injury type or severity.^[12] In patients with suspected or identified injury, additional surgeries or endoscopic procedures may be required to diagnose the injury, to treat acute intra-abdominal processes such as biliary peritonitis, and to definitively treat biliary

injury with reconstitution of bilioenteric flow. Each additional procedure adds to the healthcare cost and presents a procedure-related risk of adverse events, and the deleterious effects on patients' quality of life (QOL) have been shown to extend dramatically beyond the acute injury and treatment phases. Both early and delayed repair of CBDI are described.^[13] Because no guideline exists to guide the timing of repair, the decision for timing of repair in a patient equally eligible for early or delayed repair should be based on the predicted success of the procedure and patient safety. If equivalent technical and morbidity outcomes can be achieved, patient quality of life and efficient healthcare resource utilization should be considered.^[14] The present study aimed at assessing outcome of early and delayed repair of bile duct injury.

There were 26 males and 23 females in age group 30-40 years, 18 males and 11 females in age group 40-50 years, age group 20-30 years had 10 males and 7 females and age group 50-60 years had 10 males and 7 females. A study by Kirks et al,^[15] in year 2016 conducted study on patients with CBDI managed surgically. Outcomes of patients undergoing early (<48 hours from injury) and delayed (>48 hours) repair were compared. It was seen that in total, 61 patients underwent surgical biliary reconstruction. Between the early and delayed

repair groups, no differences were found in patient demographics, injury classification subtype, vasculobiliary injury (VBI) incidence, hospital length of stay, 30-day readmission rate, or 90-day mortality rate. Patients undergoing delayed repair exhibited increased chance of readmission if VBI was present or if multiple endoscopic procedures were performed prior to repair.

In our study cholecystectomy was main etiology which was seen in 30 patients in group I and 25 in group II, non-biliary abdominal procedures 20 in group I and 22 in group II and abdominal trauma 6 in group I and 9 in group II. Wang et al,^[16] in their study found that the rate of repair failure was significantly higher for early versus delayed repair, lower for early versus delayed referral, but did not differ substantially for on-table versus post-cholecystectomy repair. Regarding postoperative complications, early referral outperformed delayed referral however, we found no significant differences between early and delayed repair, or between on-table and post-cholecystectomy repair. At the cut-off time point of 6 weeks, early repair was associated with increased rates of repair failure, postoperative complications and biliary stricture.

Strasburg-Bismuth classification C was seen in 2 in group I and 1 in group II, D in 3 in group I and 4 in group II, E1 24 in group I and 20 in group II, E2 22 in group I and 28 in group II, E3 2 in group I and 2 in group II, E4 2 in group I and 1 in group II and E5 1 in group I. Felekouras et al,^[17] evaluated the effect of timing of management and intervention on outcomes of bile duct injury on 92 patients in which three patients were treated conservatively, two patients were treated with percutaneous drainage, and 13 patients underwent PTC or ERCP. In total 74 patients were operated on in our unit. 58 of

them underwent surgical reconstruction by end-to-side Roux-en-Y hepaticojejunostomy, 11 underwent primary bile duct repair, and the remaining 5 underwent more complex procedures. Of the 56 patients, 34 patients were submitted to early reconstruction, while 22 patients were submitted to late reconstruction. After a median follow-up of 93 months, there were two deaths associated with BDI after LC. Outcomes after early repairs were equal to outcomes after late repairs when performed by specialists.

Schreuder et al,^[18] conducted a study on the long-term outcome of BDI. Although clinical outcomes of endoscopic, radiologic, and surgical treatment of BDI are good with success rates of around 90%, quality of life (QoL) may be impaired even after “clinically successful” treatment. Following surgical treatment, the incidence of anastomotic strictures varies from 5 to 69%, with most studies reporting incidences around 10–20%. The median time to stricture formation varies between 11 and 30 months. Long-term BDI-related mortality varies between 1.8 and 4.6%. Of 91 patients treated in our center for anastomotic strictures after HJ, 81 (89%) were treated by percutaneous balloon dilatation, with a long-term success rate of 77%. Twenty-four patients primarily or secondarily underwent surgical revision, with recurrent strictures occurring in 21%.^[19]

The early and accurate diagnosis of IBDI is very important for both patients and gastrointestinal surgeons because unrecognized IBDI leads to serious complications such as biliary cirrhosis, hepatic failure, and death.

CONCLUSION

There were equivalent outcomes for patients undergoing early and delayed repair of CBD

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