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A study of early and delayed repair of common bile duct injury in Western Maharashtra

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Abstract
Background: Injury to the extrahepatic biliary tree is a well-identified complication of cholecystectomy. The present study was conducted to compare results of early and delayed repair of common bile duct injury.
Materials & Methods: 74 patients of bile duct injury of both genders were divided into 2 groups of 37 each. Group I was acute (≤48 h from index procedure) and group II was delayed (>48 h after index procedure). Aetiology, hospital length of stay and time to repair was recorded.
Results: There were 27 males and 10 females in group I and 25 males and 12 females in group II. Type A was seen in 0 and 1, B in 2 and 4, C in 5 and 6, D in 8 and 3, E1 in 4 and 7, E2 in 6 and 6, E3 in 8 and 4, E4 in 1 and 3, E5 in 3 and 1 and Xa in 0 and 2 in group I and II respectively. The difference was statistically significant ($P< 0.05$). Aetiology was cholecystectomy in 20 in group I and 21 in group II, abdominal trauma in 12 in group I and 11 in group II and non-biliary abdominal procedures seen in 3 in group I and 5 in group II. The mean hospital length of stay was 7.2 days in group I and 8.6 days in group II and time to repair was 1.6 days in group I and 40.2 days in group II. The difference was significant ($P< 0.05$).
Conclusion: Early repair had better treatment outcome as compared to late repair of bile duct injury. However more research is needed to identify the factors that determine morbidity and results in patients undergoing CBDI repair.

Keywords: Bile, duct, cholecystectomy, early repair

Introduction
Injury to the extrahepatic biliary tree is a well-described complication of cholecystectomy. Though a recent publication describes a decreasing rate of CBDI associated with laparoscopic cholecystectomy, CBDI remains a serious concern for patients and surgeons [1, 2]. 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 [3].
Reports have estimated that 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. There seems to be a trend to more complicated and proximal injuries (injury <2 cm from the bifurcation) [4]. 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. Previous studies of CBDI have identified several factors associated with successful repair [5]. These include treatment by an experienced hepatopancreatobiliary (HPB) surgeon and specialized centre as well as multidisciplinary perioperative care. The management of patients suffering from BDI is a true challenge for every surgeon, particularly for those specialized in hepatobiliary surgery [6]. The present study was conducted to compare outcome of early and delayed repair of common bile duct injury.

Materials and Methods
This was a cross-sectional study of 74 patients, presenting to department of surgery, Prakash institute of medical sciences and research, Islampur, between 2019 and 2021. The present study comprised of 74 patients of bile duct injury of both genders. The consent was obtained from all patients. Data such as name, age, gender etc. was recorded. BDI type was reported according to the Strasberg-Bismuth classification system. Patients were divided into 2 groups of 37 each. Group I was acute (≤48 h from index procedure) and group II was delayed (>48 h after index procedure). Aetiology, hospital length of stay and time to repair was recorded.

Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant. The data was conducted after obtaining permission from institutional ethical clearance committee of institution.

Results

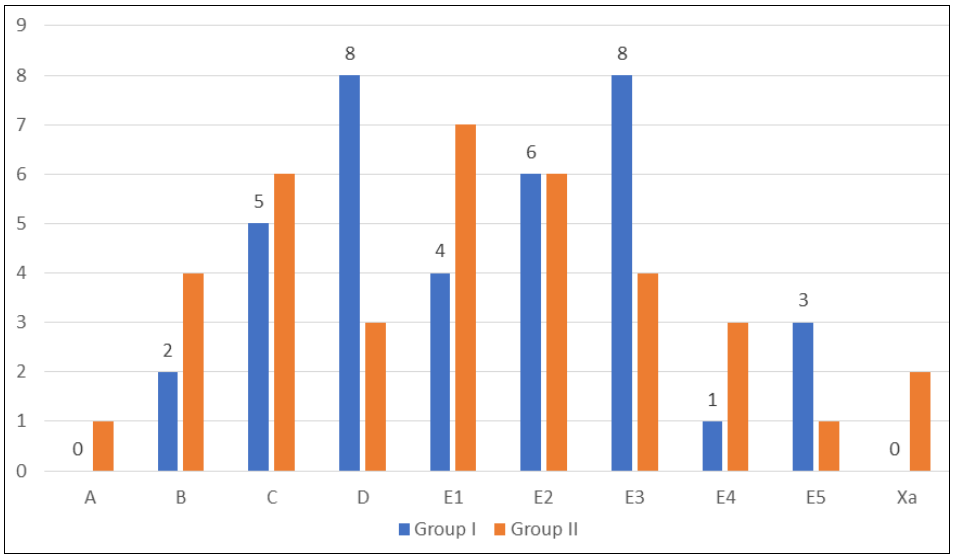
Table 1 shows that there were 27 males and 10 females in group I and 25 males and 12 females in group II. Table 2, graph I shows that type A was seen in 0 and 1, B in 2 and 4, C in 5 and 6, D in 8 and 3, E1 in 4 and 7, E2 in 6 and 6, E3 in 8 and 4, E4 in 1 and 3, E5 in 3 and 1 and Xa in 0 and 2 in group I and II respectively. The difference was significant ($P< 0.05$). Table 3 shows that aetiology was cholecystectomy in 20 in group I and 21 in group II, abdominal trauma in 12 in group I and 11 in group II and non-biliary abdominal procedures seen in 3 in group I and 5 in group II. The mean hospital length of stay was 7.2 days in group I and 8.6 days in group II and time to repair was 1.6 days in group I and 40.2 days in group II. The difference was significant ($P< 0.05$).

Table 1: Distribution of patients

Groups	Group I	Group II
Status	Early	Delayed
M:F	27:10	25:12

Table 2: Strasburg-Bismuth classification.

Type	Group I	Group II	P value
A	0	1	0.05
B	2	4	
C	5	6	
D	8	3	
E1	4	7	
E2	6	6	
E3	8	4	
E4	1	3	
E5	3	1	
Xa	0	2	



Graph 1: Strasburg-Bismuth classification

Table 3: Comparison of parameters.

Parameters	Variables	Group I	Group II	P value
Aetiology	Cholecystectomy	20	21	0.05
	Abdominal trauma	12	11	
	Non-biliary abdominal procedures	3	5	
Hospital length of stay (Days)		7.2	8.6	0.05
Time to repair (Days)		1.6	40.2	0.001

Discussion: The management of patients suffering from BDI is a true challenge for every surgeon, particularly for those specialized in hepatobiliary surgery [7]. These patients should always be referred to a tertiary referral center for appropriate treatment due to the complexity of presentation that these injuries tend to have [8, 9]. 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. The most severe lesions such as bile duct transection or recurrent strictures tend to require reconstructive surgery [10]. The present study was conducted to compare outcome of early and delayed repair of common bile duct injury.

In present study, there were 27 males and 10 females in group I and 25 males and 12 females in group II. Kirks *et al.* [11] in their study patients with CBDI managed surgically and were retrospectively reviewed. Outcomes of patients undergoing early (≤48 h from injury) and delayed (>48 h) repair were compared. Predictive modelling for readmission was performed for patients undergoing delayed repair. 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. A predictive model was constructed with these variables.

We found that type A was seen in 0 and 1, B in 2 and 4, C in 5 and 6, D in 8 and 3, E1 in 4 and 7, E2 in 6 and 6, E3 in 8 and 4, E4 in 1 and 3, E5 in 3 and 1 and Xa in 0 and 2 in group I and II respectively. Felekouras *et al.* [12] retrospectively analysed 92

patients between 1991 and 2011. Data concerned patient's demographic characteristics, type of injury (according to Strasberg classification), time to referral, diagnostic procedures, timing of surgical management, and final outcome. The endpoint was the comparison of postoperative morbidity (stricture, recurrent cholangitis, required interventions/dilations, and redo reconstruction) and mortality between early (less than 2 weeks) and late (over 12 weeks) surgical reconstruction. 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.

We observed that aetiology was cholecystectomy in 20 in group I and 21 in group II, abdominal trauma in 12 in group I and 11 in group II and non-biliary abdominal procedures seen in 3 in group I and 5 in group II. The mean hospital length of stay was 7.2 days in group I and 8.6 days in group II and time to repair was 1.6 days in group I and 40.2 days in group II. Strasberg *et al*. [13] suggested that extreme VBI may occur in 10% of VBI; this occurrence constitutes 8.3% of the CMC experience with VBI. Early hepaticojejunostomy after initial damage control surgery is performed only during second-look procedures following resuscitation and when primary repair is not feasible based on tissue quality, the location of injury, or for segmental biliary resections. This is not performed following washout for biliary peritonitis given the concern for two anastomoses in an infected or inflamed field.

Similar results also have been obtained by Kumar S to compare outcome of early and delayed repair of bile duct injuries. Sixty-four patients of bile duct injuries of either gender were divided into group I (Early repair) and group II (Delayed repair). Operative findings such as injury classification and procedural variables, and postoperative course including 30-day readmission and 90-day mortality were recorded. Results showed that etiology was cholecystectomy in 25 and 21, abdominal trauma in 7 and 8 and non-biliary abdominal procedures in 2 and 5 in group I and II respectively. There were 18 males and 14 females and 16 males and 16 females in group I and II respectively. Hospital length of stay was 7.1 days in group I and 8.4 days, 30 days of re- admission was seen in 3 and 4 and 90 days of mortality was seen in 2 in group I and 1 in group II. Strasburg-Bismuth classification showed A in 1 and 2, B in 3 and 4, C in 8 and 1, D in 6 and 4, E1 in 4 and 4, E2 in 3 and 5, E3 in 4 and 6, E4 in 3 and 4, E5 in 2 and 3 and X in 0 and 1 in group I and II respectively. Preoperative PTC catheter placement was seen in 0 and 18, preoperative percutaneous transabdominal drain placement was seen in 0 and 12 in group I and II respectively. Authors concluded that early repair found to be better as compared to delayed repair of bile duct injury [14].

Future directions for investigation include QOL assessment for endoscopic management, open repair, and minimally invasive repair. A standardized, evidence-based pathway for perioperative management of patients undergoing bilioenteric reconstruction is suggested with prospective data collection to strengthen existing predictive platforms and potentially identify injury-specific determinants of morbidity.

Conclusion

Authors found that early repair had better treatment outcome as compared to late repair of bile duct injury. Further analysis is required to investigate the determinants of morbidity and outcomes in patients undergoing CBDI repair.

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