

## BILE DUCT INJURIES AND OUTCOMES: A RETROSPECTIVE MEDICAL RECORD REVIEW

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### ABSTRACT

**Objective:** To report on our experience of cholecystectomy associated bile duct injuries and observe factors influencing outcomes.

**Study Design:** Simple descriptive study.

**Place and Duration of Study:** Surgical unit IV, Military Hospital (MH) Rawalpindi, over a period of seven years from 01-01-2005 to 1-12-2012.

**Material and Methods:** Eighty eight patients who underwent repair of bile duct injuries during this period were included in this study. Patients referred from class 'B' and 'C' hospitals to our institute were also included.

**Results:** Fifteen immediate repairs (0-72 hours) post cholecystectomy, forty eight intermediate repairs (72hrs-6wks) and twenty five late repairs (> 6 wks) were performed (table-1). Short term morbidity was higher in patients with upper biliary tract injury ( $p=.04$ ). The most common long-term complication was biliary stricture, which occurred in 28 patients (31.8%). Patients with bile duct injuries (BDIs) repaired in intermediate period were more prone to develop stricture of biliary tree than those repaired in immediate or late period ( $p=.03$ ) (table 3). Long term morbidity was also higher in patients who presented with bile contamination of peritoneum ( $p=.03$ ) and had sustained complex biliary tract injuries (E4/E5) ( $p=.03$ ). The overall morbidity and mortality rate was 31% and 3% respectively.

**Conclusion:** We observed that complex hilar injury, presence of intra-abdominal bile and timing of BDI repair is an important predictor of long-term outcome. Injuries repaired in early (0-72hrs) or late period (>6wks) were less likely to develop biliary stricture as compared to injuries repaired in intermediate period (72hrs-6wks). Moreover complex hilar injuries and intra-abdominal bile at presentation increases the possibility for development of late biliary stricture.

**Keywords:** Bile duct injury, Cholecystectomy, Post-operative complications.

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### INTRODUCTION

Cholecystectomy is one of the most commonly performed procedures on surgical floor for symptomatic gallstones and laparoscopic cholecystectomy (LC) has become gold standard in recent times. Bile duct injuries (BDIs) after open or laparoscopic cholecystectomy (LC) pose a remarkable clinical problem with significant morbidity for patients<sup>2</sup>. In the literature, the complication rate for open cholecystectomy has been estimated to be 0.2% whereas approximately 0.4%-0.6% with LC<sup>3-5</sup>. Such BDIs can be associated with lifelong

morbidity and even mortality<sup>6,7</sup>. BDIs range from minor accessory duct leakage to complex hilar injuries as described and classified by Strassburg et al<sup>8</sup>. Late complications such as anastomotic bile duct strictures or secondary biliary cirrhosis may result in lifelong disability<sup>3</sup>. Among hepatobiliary surgeons, debates exist regarding the optimal timing of repair after BDIs<sup>9,12</sup>. Short-term complications: defined as those occurring within 30 days of the repair surgery or during the same hospitalization. Long term complications: those occurring 30 days post repair and include bile duct strictures. Biliary stricture: defined as a stricture that resulted in signs and symptoms requiring either surgical or endoscopic intervention. It is generally accepted that if an injury is identified

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intraoperatively, Immediate repair by a hepatobiliary surgeon is the best approach<sup>9,10</sup>. Injuries missed initially can present days to weeks following LC. As a result, the optimal timing of repair is not clear<sup>13</sup>. Schmidt et al<sup>4</sup> prefer an early repair because it decreases hospital stay, pain, and inconvenience whereas de Reuver et al<sup>13</sup> and Bergman et al<sup>14</sup> prefer a later repair because they argue that an early repair has a higher risk of developing biliary stricture.

The purpose of the present study is to review the results of surgical repair of BDIs at a major referral center. The primary outcome of this study is to describe early and late postoperative complications of BDI repair. Predictors of these complications used to influence the timing of repair.

**MATERIAL AND METHODS**

This descriptive study was, conducted in Surgical Unit IV, Military Hospital (MH) Rawalpindi during a 7 year period from January 2005 to December 2012. Eighty-eight patients with major BDIs (few sustaining

postoperative outcomes extracted. Approval obtained from hospital ethical committee. Preoperative investigations to evaluate biliary anatomy carried out. Patients underwent trans-abdominal ultrasonography, computed tomography, endoscopic retrograde cholangiopancreatography with or without percutaneous transhepatic cholangiography and magnetic resonance imaging as required. Patients with suspected BDIs admitted in high dependency unit. If there was evidence of preoperative bile leak and/or intra-abdominal sepsis, preoperative antibiotics administered, as appropriate. The anatomic extent of BDIs were classified according to the Strasberg-Bismuth classification system (table-2)<sup>8</sup>. Repair of cholecystectomy-associated BDIs were classified into 3 groups based on timing of repair from time of injury: Immediate repair:

within 0-72 hours after BDI, intermediate repair: between 72 hours to 6 weeks, late repair: after 6 weeks.

Bile leak: defined as intra-abdominal bile identified in the postoperative period, excluding those identified intra-operatively

**Table-1: Showing demographic data.**

Characteristics	Data	No. of cases (%) (n=88)
Sex	Male	25 (28.4%)
	Female	63 (71.5%)
Age	<50 years	33 (37.5%)
	>50 years	55 (62.5%)
Mode of cholecystectomy	Open	58 (65.9%)
	Laparoscopic	30 (34%)
Bile leak	Present	40 (45.4%)
Jaundice	Present	55 (62.5%)
Type of repair	Hepaticojejunostomy	50 (56.8%)
	Choledochojejunostomy	23 (26.1%)
	Primary repair	12 (13.6%)
	Isolated hepatic duct anastomosis	3 (3.4%)
Timing of repair	Immediate	15 (17.0%)
	Intermediate	48 (54.5%)
	Late	25 (28.4%)
Short term complications	Present	30 (34.0%)
Long term complications	Present	28 (31.8%)

injuries in our hospital and some referred from peripheral hospitals after BDIs) reviewed. All patients who underwent repair surgery for BDIs identified. Data including patient demographics, operative details and

during cholecystectomy Jaundice: total serum bilirubin more than twice the upper limit of normal biliary stricture: a stricture that resulted in signs and symptoms requiring either surgical or endoscopic intervention. The inflammatory

response expected to be minimal during the immediate and late periods whereas an active inflammatory process would be present during the intermediate period. The Dindo grade classification system<sup>15</sup> used to grade short-term postoperative complications. The SPSS statistical analysis program, version 14, used to analyze the data. Statistical analysis performed using the  $\chi^2$  test. A  $p < 0.05$  was considered significant.

## RESULTS

Eighty-eight patients reviewed (table-1). Mean age was 55.4 years [SD 14]. Twelve patients (13.6%) identified injured per operatively and treated accordingly whereas 76 patients (86.4%) presented postoperatively. Among these patients bile leak was present in 40 patients (45.5%) and 55 patients (62.5%) were jaundiced at the time of presentation. BDIs were classified according to Strasburg Bismuth classification shown in (table-2). Short-term

had repairs in intermediate period, 5 in immediate and 1 repaired late ( $p = .03$ ). Presence of intra-abdominal bile ( $p = .03$ ) and complex hilar injuries (E4/E5) ( $p = .03$ ) were also noted associated with long-term morbidity (table-3).

## DISCUSSION

Although cholecystectomy is one of most commonly performed procedures on surgical floor, yet no surgeon is immune to cholecystectomy related complications such as BDIs. These injuries usually occur in patients who have acute or chronic inflammation that obscures normal anatomic planes in the hepatocystic triangle or when the common bile duct is anatomically misidentified<sup>14</sup>. There is consensus that BDIs, should be repaired in specialized hepatobiliary centers<sup>16</sup>, but the timing of repair after BDI remains controversial<sup>13</sup>. It has been proved that patients in whom BDI are identified perioperative should be repaired immediately (when there is

**Table-2: Showing strasburg-bismuth injury classification.**

Injury class	Description	No (%)
A	Leak from subvesical duct	0
B	Clipped and divided right segmental duct	0
C	Divided right segmental duct	0
D	Lateral injury common hepatic duct	13(14.8%)
E1	Common hepatic duct division >2 cm from bifurcation	30(34%)
E2	Common hepatic duct division <2 cm from bifurcation	13(14.8%)
E3	Common duct stricture at bifurcation but confluence intact	27 (30.6%)
E4	Separate left and right hepatic duct strictures	3(3.4%)
E5	Combined injury to main duct at bifurcation and right segmental bile duct	2(2.27%)

complications were present in 30 patients (34%) with higher biliary tract injury ( $p = .04$ ). The most common complication was cholangitis, which occurred in 10 patients (11.3%). Other short-term complications included wound infection in 8 patients (9%), intra-abdominal abscess in 5 patients (5.6%) and adult respiratory distress syndrome in 3 patients (3.4%). The most common long-term complication is biliary stricture, which occurred in 28 patients (31.8%). 22 out of 28 patients, which developed stricture,

minimal sepsis and peritoneal contamination) by experienced hepatobiliary team<sup>7,12</sup>. This approach is time saving, cost effective and is associated with less morbidity, mortality and hospital stay<sup>7</sup>. There are advocates for immediate repair de Reuver et al<sup>13</sup> reported results of 151 patients who underwent repair for BDIs. They determined that patients who underwent repair within 6 weeks after BDI had a statistically significantly higher rate of postoperative strictures ( $p = .03$ ) compared with

BDI repaired after 6 weeks. Most authors have advised repairs in late period i.e. after 6 weeks when intra-abdominal inflammation has settled and a technically better reconstruction performed<sup>4,13,14</sup>. They argue that when repairs are performed in early periods ischemic ductal tissue is replaced with fibrotic tissue thus facilitating formation of strictures.

In our cohort of patients, we identified two

inflammation in right upper quadrant. The presence of bile even in the absence of intra abdominal sepsis may result in increased acute inflammatory changes in the surgical bed<sup>4</sup>. There is a temptation to repair BDI in intermediate period when ductal tissue is friable and ischemic. These inflammatory changes may predispose patients to fibrosis, resulting in a late biliary stricture<sup>17</sup>. However in early period (0-72 hours), repairs are performed

**Table-3: Short and long term complications in both group.**

Predictor of outcome	Short term complications (30 Patients)		Long term complications (28 Patients)	
	No.	p value	No.	p value
Gender		.62		.37
Male	10		5	
Female	20		23	
Age		.64		.52
<50 years	13		13	
>50 years	17		15	
Mode		.43		.52
Open	23		20	
Laparoscopic	7		8	
Bile leak		.70		.03
Present	15		20	
Absent	15		8	
Jaundice		.27		.92
Present	23		10	
Absent	7		18	
Strasburg		.04		.03
A-E3	25		22	
E4-E5	5		6	
Type of repair		.42		.45
Hep	10		8	
Chol	15		15	
Prim	4		3	
Isolated	1		2	

periods of BDI repairs i.e. early (0-72 hours) and late (>6 weeks) when chances of postoperative stricture formation were minimal. Whereas, patients in whom BDIs were repaired in intermediate (72 hours-6 weeks) period had a significantly higher rate of biliary stricture formation. We also identified that patients with bile peritonitis and complex hilar injury also had a greater risk for developing late biliary stricture. We assume that patients with clinically obvious bile leak present earlier as compared to patients with no bile leak. As a result, at the time of presentation these patients have gross peritoneal contamination, sepsis and

before peritoneal contamination and inflammation have set in. In late repairs (>6 weeks) inflammatory process usually settles before definitive repairs are undertaken.

**CONCLUSION**

The results of our study suggest that high degree of suspicion and early recognition of BDIs is the key to successful surgery. BDIs identified early should be repaired immediately within 72 hours. However, if they become obvious in intermediate period or if there is bile contamination of abdomen, definitive repair should be undertaken in delayed period i.e.

after 6 weeks. Moreover, surgeons experienced in hepatobiliary surgery in specialized hepatobiliary units should repair complex hilar injuries (E4/E5).

### CONFLICT OF INTEREST

The authors of this study reported no conflict of interest.

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