

## BILE DUCT INJURY COMPLICATIONS AND MANAGEMENT

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### Abstract

Injury to biliary ductal system is well known since long time. It may occur during cholecystectomy, bile duct exploration, gastric & pancreatic surgery, liver transplantation, blunt & penetrating abdominal injury. The introduction of laparoscopic cholecystectomy has been associated with an increased incidence of bile duct injury. The aim of this study is to find out the pattern and presentation, complications and safe management of patients of bile duct injury attended in the hospital.

This present prospective study was conducted in the Department of surgery of BSMMU & the Department of Hepato- Biliary & Pancreatic Surgery, BIRDEM Hospital, Dhaka from July 2003 to June 2005. Study population was 30 patients of bile duct injury. All the injuries occurred during cholecystectomy either laparoscopic or open technique. Among them laparoscopic cholecystectomy ranked the top. Young and active females were the common sufferers. 15 patients were recognized during primary operation and managed at the same setting. Among them 46.7% repaired by laparoscopic suturing, 46.7% converted into open repair & T-tube drainage and 6.7% by biliary reconstructive surgery. Another 15 patients were not recognized during primary operation and presented later on with complications like obstructive jaundice, biliary peritonitis, abdominal distension, abdominal pain, fever and biliary fistula. Most of the patients required biliary reconstructive surgery but one patient treated by ERCP & stenting. In the early presentation five patients developed bile leakage which were treated conservatively in two patients and by ERCP & stenting in three patients. In late presentation three patients developed cholangitis which were treated conservatively, three patients developed wound infection which were treated by secondary wound closure. Three patients died from septicaemia and multiorgan failure in late presentation.

### Introduction

Injury to biliary ductal system is well known since long time. It may occur during laparoscopic and open cholecystectomy, bile duct exploration, pancreatic

surgery, gastric and hepatic surgery, blunt or penetrating abdominal injury and liver transplantation. Injury to the biliary tract is reported an approximately 0.2% of patient undergoing open cholecystectomy<sup>1</sup>. The introduction of laparoscopic cholecystectomy has been associated with an increase incidence of bile duct injury<sup>2</sup>.

Iatrogenic bile duct injuries are important because those are preventable and produce considerable morbidity and occasional mortality, the cost of which is for exceeding that recognized for initial procedure. Laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic gallstone diseases. The possible mechanisms may be responsible for the bile duct injury during laparoscopic cholecystectomy<sup>3</sup> are:

- 1) Inappropriate traction
- 2) Injudicial use of diathermy
- 3) Failure to identify the anatomy

The common complications encountered for bile duct injuries are sub-hepatic and sub-phrenic collection, cholangitis, biliary peritonitis, biliary fistula and pulmonary complications. However it is imperative that any attempt at repair be carried out in a precise and expert manner in the setting of a specialized centre<sup>4</sup>. The best results are achieved through early diagnosis, mature clinical judgment, adequate technical expertise and reconstruction with minimum of attempts.

### Materials and Methods

This prospective case study was conducted at the Department of Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka and the Department of Hepato-biliary and Pancreatic surgery (HBPS), BIRDEM Hospital, Dhaka from July 2003 to June 2005. Thirty patients were enrolled in this present study. Among them 15 patients were included in group-A- Early per-operative diagnosis and management and the remaining 15 patients were included in group-B- Late diagnosis and management of bile duct injury. Selected patients were those who were attended in the hospital with bile duct injury. All the patients were given an explanation of the study and informed consent was taken. This study did not involve any additional investigative procedure and to avoid significant risk as well as economic burden to the patients. All patients were

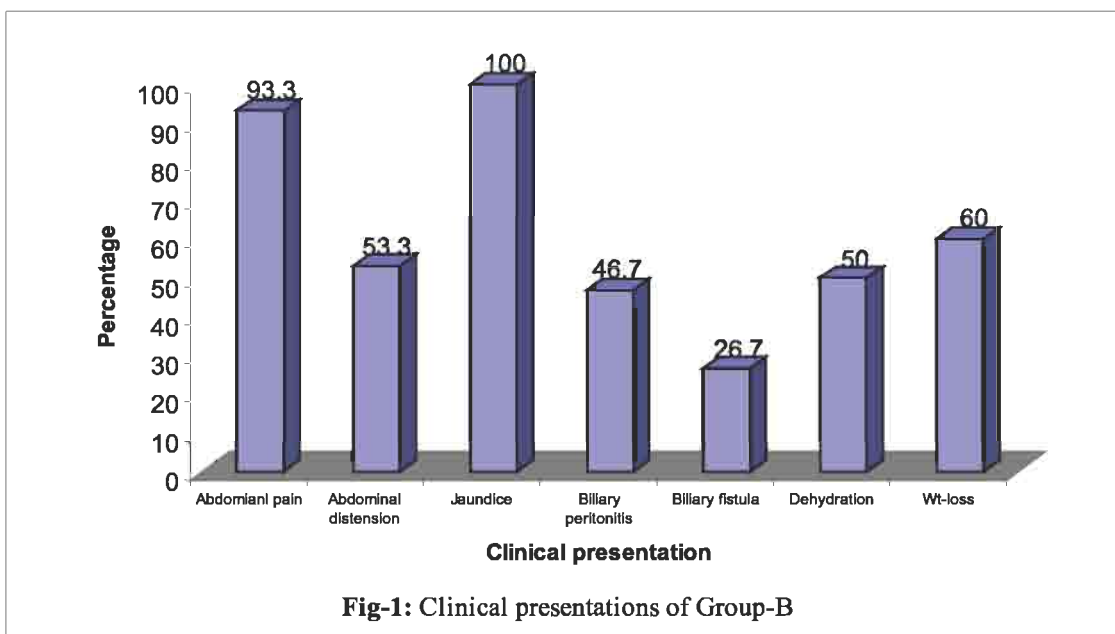
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followed up regularly during their stay in the hospital and at a regular interval as out patient for a period of at least six months. Criteria for assessing the late result of biliary injury management were:- Excellent- those patients who had no symptoms, normal liver function test and normal USG findings, Good:-were those patients who had pain abdomen but normal liver function test and normal USG findings and Poor:- those patients who had persistent or worse symptoms, elevated liver function test and abnormal USG findings.

**Result**

All the injuries occurred during cholecystectomy either open or laparoscopic technique. Among them

Nature of injury in comparison of two groups were avulsion of cystic duct were 20% in group A, partial transection of CHD were 66.7% in group A and 33.3% in group B, complete transection of CHD were 13.3% in both groups, complete ligation of CHD were 13.3% in group B and vascular injury were 40% in group B. Common presentation of group-B patients were obstructive jaundice, abdominal pain, abdominal distention, intra-abdominal collection, biliary peritonitis, biliary fistula and cholangitis. Injury to group-A patients were recognized during primary operation and managed at the same settings. Out of 15 patients, 46.7% were repaired with laparoscopic suturing, 46.7% converted to open repair and T-tube drainage and 6.7% required biliary



laparoscopic cholecystectomy ranked the top. Young and active females were common sufferer. Site of injury according to Bismuth Grade were Grade I - 40% in group-A and 60% in group - B, Grade II - 53.3% in group - A and 40% in group - B, Grade V - 6.7% in group A.

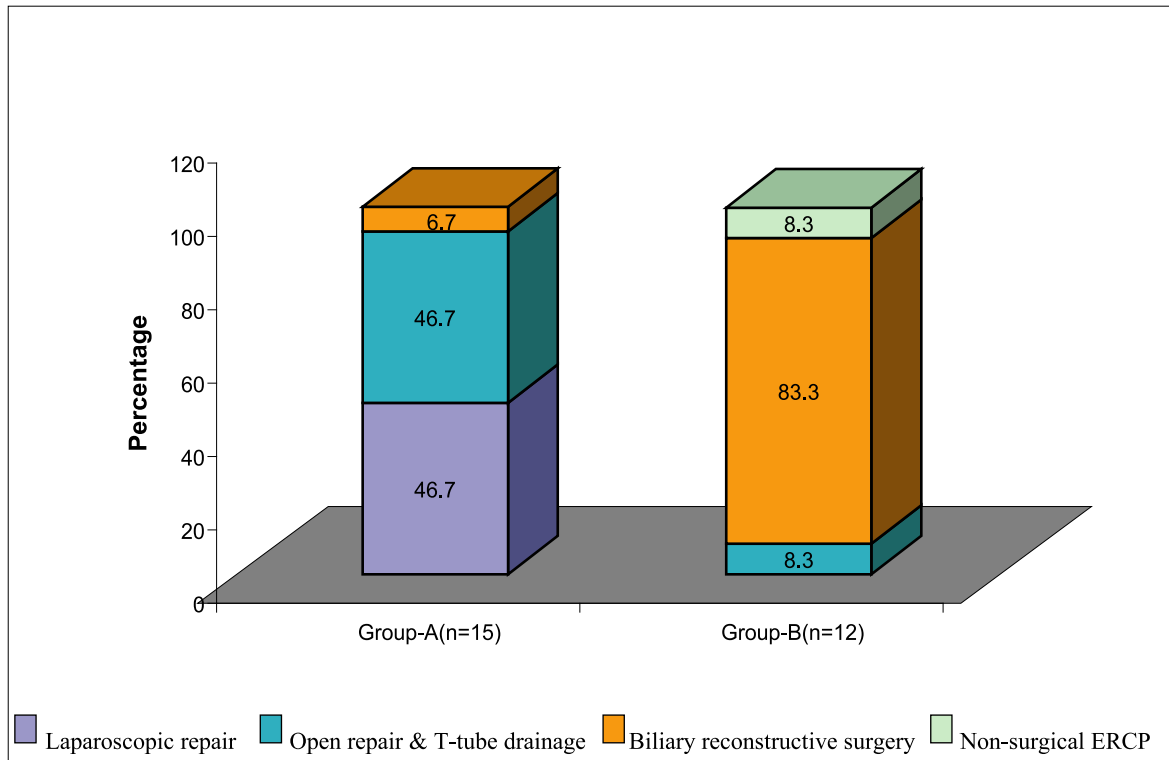
reconstructive surgery. Injury to group-B could not be recognized during primary operation. Most of the patients presented within one month of primary surgery and a few patients presented after several months. Several investigations of group-B patients were performed to pin

**Table - I:** Comparison of site of injury according to Bismuth grading

Bismuth Grade	Group	
	Group-A (n = 15) (%)	Group-B (n = 15) (%)
Grade I	40.0	60.0
Grade II	53.3	40.0
Grade V	6.7	00

**Table - II :** Comparison of nature of injury between groups

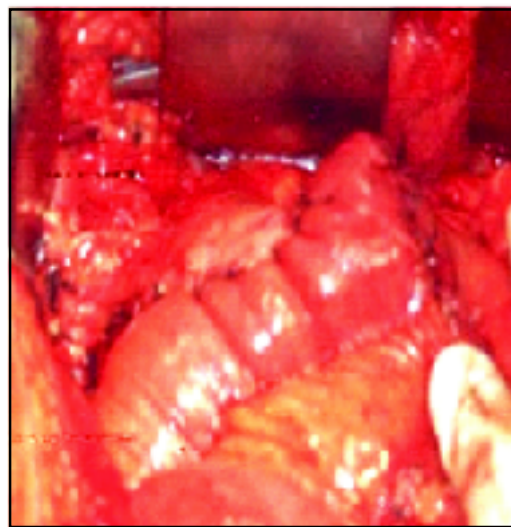
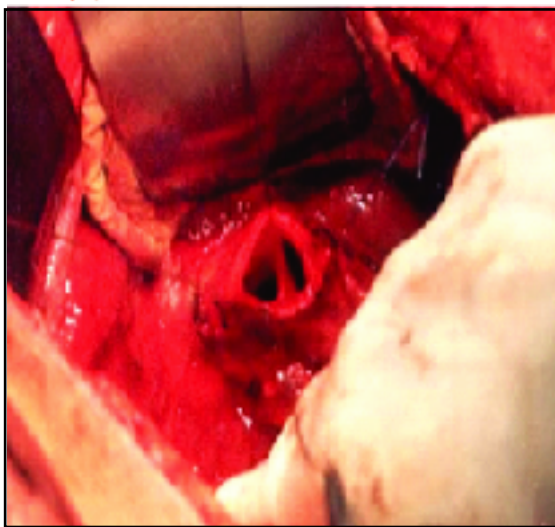
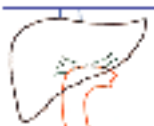
Nature of injury	Group	
	Group-A (n = 15) (%)	Group-B (n = 15) (%)
Avulsion of Cystic Duct	20.0	00
Partial trans-section of CHD	66.7	33.3
Complete trans-section of CHD	13.3	13.3
Complete ligation of CHD	00	13.3
Vascular injury	00	40.0



**Fig-2:** Bar diagram showing frequency of Patients distributed as per management

point the pathology. Majority of patients of group-B (83.3%) needed biliary reconstructive surgery and 8.3% patients treated by open repair and T-tube drainage and 8.3% patients managed by ERCP & stenting, Reconstructive procedure was Roux-en-Y hepaticojejunostomy.

complications in group A were conservative of two patients and ERCP & stenting of three patients and in group B by secondary wound closure. None of group-A patients encountered mortality while three (20%) patients of group-B died of complications like septicemia and multi-organ failure. Cost effectiveness of group-A was



**Fig-3:** Hepaticojejunostomy

In term of post operative complications around one third (33.3%) of group-A developed bile leakage, while 50% of the group-B developed wound infection. Management of

less due to management during initial operation and less hospital stay and no need of second time investigations. On the other hand cost effectiveness was more in group-B



**Fig-4: Completed Reconstruction**

due to more hospital stay, second time investigations and second time operative procedures. In comparison to follow up result between groups excellent 40% & good 60% in Group A and excellent 11.1% & good 88.9% in group B patients.

#### **Discussion**

This study included 30 patients irrespective of age and sex. Females were predominating as per sex was concerned in both groups. The finding indicates that peoples of young and active states especially females were common sufferers, thus age and sex distribution was almost similar with the study conducted by Mirza<sup>5</sup>. This higher incidence of injury in female is probably due to the fact that gall stone disease is more common in female. This report is consistent with the report of others<sup>4,7</sup>.

In this study of 30 cases of both group-A & group-B, highest number of injuries occurred during laparoscopic cholecystectomy which was almost two third of the cases. About 40% injuries were during open cholecystectomy and three injuries were detected late post operatively. In a study in France, out of 22 patients of bile duct injury, 18 were during laparoscopic cholecystectomy<sup>8</sup>. Another study showed that laparoscopic cholecystectomy appears to have a higher common duct injury rate and lower mortality rate<sup>9</sup>. Another study conducted by Mianian et al showed that out of 30 common bile duct injuries 28 were during laparoscopic cholecystectomy and other two resulted from open cholecystectomy<sup>10</sup>. Study of Shahr et al showed that out of 131 bile duct injuries that occur 82 at open cholecystectomy, 64 at laparoscopic cholecystectomy and 5 at liver resection<sup>11</sup>. All these studies were consistent with that of the present study. In a study conducted by Yang et al showed that out of 182 bile duct injuries 152 were during open cholecystectomy and 30 were during laparoscopic cholecystectomy<sup>11</sup>.

Regarding the time of presentation in this study, group-A patients were diagnosed during primary operation and managed accordingly. In group-B patients most were

presented within one month. A study showed patient were transferred at a median of 26 days after laparoscopic cholecystectomy although initial symptoms were noted at a median of 3 days after cholecystectomy<sup>12</sup>. In another study out of 32 patients 10 were recognized immediately, 22 were presented some time after operation<sup>12</sup>. So most of the patients of bile duct injury usually present in early post operative period. In another series 11 out of 20 injuries were identified at the time of operation. The remainder were diagnosed at a median of 7 days after surgery with a presentation of jaundice or abdominal pain<sup>14</sup>. All these studies were almost consistent with that of this study. In a study showed that out of 32 patients 10 were recognized immediately. The remaining 22 patients had pain, jaundice and/or fever as the symptoms heralding the injury<sup>15</sup>. In another study of Abdel-Whahab et al showed that injuries were detected in 44 patients post operatively<sup>12</sup>. The mode of presentation was jaundice, biliary fistula with or without jaundice and biliary peritonitis. Study carried out on 2001 showed that out of 34 patients 16 were detected during laparoscopic cholecystectomy and managed immediately. Another 18 patients who sustained injury elsewhere, 9 had external biliary fistula, one had biliary peritonitis and eight had benign biliary stricture<sup>14</sup>. These may occur due to bile leakage from complete or partial transection of bile duct or due to ligation of bile duct or biliary stricture. Sicklick et al showed that 58% of bile duct injury patients presented with bile leak, biloma or jaundice<sup>17</sup>. These studies were consistent with that of the present study.

In this study most of the cases were Bismuth grade I & II both in group-A and group-B patient. A study conducted in France showed Bismuth grade 1,2,3,4,5 injuries were 19%, 23%, 25%, 20%, 17%, respectively<sup>18</sup>. Outcome was dependent on Bismuth level. In a study by Al-Ghazian and Benjamin showed that out of 33 patients, 13 were Bismuth grade-II, 13 were Bismuth grade-III and seven were Bismuth grade-IV<sup>19</sup>. Study conducted in 1998 showed that 16 patients of bile duct injuries treated after laparoscopic cholecystectomy and site of injury classified based on Bismuth classification. Type I, 6 patients, Type II, 3 patients, Type III, 3 patients, Type IV, one patient, Type V, one patient<sup>20</sup>. These studies were consistent with that of this study. In this study most of the patients of group-A, were partial transection of common hepatic duct. Most of the patients of group-B were vascular injuries i.e. ischaemia of common duct that causes stricture of the duct but in group-A, it was nil. Complete transection of group A & group-B was 13.3%. In a study of Hiruyaki et al showed that out of 15 patients of laparoscopic cholecystectomy, five patients had a circumferential injury to major bile duct. The other 11 patients had partial injury to major bile duct<sup>21</sup>. Study conducted in 1998 showed that they had experienced 16 patients with bile duct injury after laparoscopic cholecystectomy. Of them five patients had a circumferential injury to the major bile duct and they

employed a converted open technique for biliary reconstruction. The other 11 had partial transection of major bile duct and they perform laparoscopic restoration and ERCP and stenting on the day after operation<sup>21</sup>. This study coincides with that of others.

Management strategy of bile duct injury is a complex one. It varies from case to case. In this study in group-A 46.7% of patients had laparoscopic repair, 46.7% had open repair and T-tube drainage, 6.7% had biliary reconstructive surgery. But in group-B most of the patients had biliary reconstructive surgery by hepaticojejunostomy with Roux-en-Y loop. In a study of Hiroyuki et al five patients out of 16 employed a converted open technique for biliary reconstruction. The other 11 patients out of 16 performed laparoscopic repair technique. Of them five patients have circumferential injury to major bile duct and they converted to open technique for biliary reconstruction. The other 11 patients had partial injury to the major bile duct and they performed laparoscopic restoration, all 11 of these patients received ERCP and stenting for biliary decompression and drainage on the day after operation<sup>21</sup>. Study conducted by Abdel-Wahab showed that 49 patients of bile duct injury were treated. Of them five patients were recognized during primary operation and immediately repaired, three by axial anastomosis with T-tube drainage, two cases by biliary reconstruction by Roux-en-Y hepaticojejunostomy, 11 were treated endoscopically, other 33 were recognized post operatively and treated surgically by biliary reconstructive surgery, 21 hepaticojejunostomy and 12 by hepaticoduodenostomy<sup>15</sup>. Definitive operation always a Roux-en-Y hepaticojejunostomy was required in 85% of patients in a study<sup>22</sup>. In another study 77% underwent Roux-en-Y-hepaticojejunostomy<sup>23</sup>. These reports supported the present study. In this study group-A patients who had early diagnosis and management, the duration of hospital stay were less than that of late diagnosis and management. The maximum duration of hospital stay in group-A (40%) in between 2-3 weeks, less than 1 week 26.7%, 1-2 weeks 26.7%. But in group-B most of the patients (87%) the duration of hospital stay was more than four weeks. In a study of Scott et al showed that patients with bile duct injuries that were recognized immediately at the time of initial surgery ultimately experienced a total cost for their repair and hospitalization of 43% to 83% less than for patients in whom recognition of the injury was delayed. In addition total hospitalization and out patient care days was reduced as much as 76% with early recognition of an iatrogenic bile duct injury<sup>24</sup>. These studies coincide with this study.

In this study the two groups were compared in respect of total period of suffering. Over half (53.3%) of patients of group-A suffered for 2-3 weeks, 40% suffered for 1-2 weeks and 6.7% for 3-4 weeks. In contrast majority (93.3%) of the group-B patients suffered for four weeks

or more and rest (6.7%) suffered for 3-4 weeks. The groups were found to be statistically significant in term of total period of suffering. In this study of group-A there was no mortality out of 15 patients but 3 out of 15 patients died due to septicaemia and multiorgan failure in group-B. In another study showed that 182 patients with iatrogenic extrahepatic bile duct injury were treated and all these injuries developed during antegrade cholecystectomy. All these patients under went biliary reconstruction with good results (161), recurrent stricture (11) and death (10)<sup>11</sup>. Study carried out by Savassi-Rocha showed that a total of 167 patients of bile duct injury treated and mortality rate was 4.2%<sup>25</sup>. This data corresponds with that of the present study.

### Conclusion

The complication of bile duct injury is less in early diagnosis but more in late diagnosis. The common complications of late diagnosis were obstructive jaundice, abdominal collection, abdominal distention, biliary peritonitis, biliary fistula and cholangitis. The mortality is more in late diagnosis. The best results are achieved through early diagnosis, mature clinical judgement and technical expertise at the first attempt of repair. So early diagnosis is essential to avoid complications of bile duct injury.

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