

## Bile duct injury during laparoscopic cholecystectomy: Experience from a tertiary care hospital of Bihar, India

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### Abstract

**Introduction:** Bile duct stone is a common disease. In the case of United States, around 30 million people are affected by bile duct stone disease annually, and around 750,000 cholecystectomies are performed per year. The aim of the study is to know the risks, incidence, types, causes of BDIs, their timing and clinical presentations, various imaging modalities, and management by various methods. **Materials and Methods:** An observational study was carried out on 100 patients at Department of General Surgery, Darbhanga Medical College and Hospital, Laheriasri, Bihar, India. All patients who underwent laparoscopic cholecystectomy with BDIs were observed and followed up. The study was conducted over a period of one year From July 2020 to June 2021 included all cases of BDI during this duration. Prior approval was obtained from the Institutional Ethics Committee. Informed written consent was obtained from each patient before participation in the study. **Results:** A total of 100 patients were observed in the study period. The mean age of these patients was  $43.8 \pm 18.2$  years with a female preponderance. The conversion of laparoscopy to open surgery was done among 12 cases. In 9 cases, this was done because of BDI, and, in 3 cases, it was done because of short cystic duct with adhesions, inflammation, and difficulty in laparoscopy. BDI was observed in 5 patients and BL occurred in another 4 cases. Of 5 cases of BDI, 4 cases were detected intraoperative and 1 case was detected postoperatively. The cases detected at the time of surgery were managed surgically by end-to-end anastomosis over a T-tube and Roux-en-Y hepaticojejunostomy. **Conclusion:** The surgeon doing laparoscopic cholecystectomy should be aware about management of such injuries, and long-term follow-up should be done for such patients.

**Key Words:** Bile duct injury, laparoscopic cholecystectomy.

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### Introduction

Bile duct stone is a common disease. In the case of United States, around 30 million people are affected by bile duct stone disease annually, and around 750,000 cholecystectomies are performed per year[1]. Initially, the open cholecystectomy was the only surgical treatment available for the gall bladder stone, but the entry of laparoscopy changed the scenario and, at present, majority of such operations are done through laparoscopic cholecystectomies[2]. With the increase in the use of laparoscopic method, incidences of bile duct injury (BDI) were also observed in more frequency, and there is a clear trend in increase in such injuries after increase in the use of laparoscopic method over open cholecystectomies[3,4]. Management of the cases of BDI and bile duct leaks is difficult and needs an experienced surgeon with the multidisciplinary team. In the case of an inexperienced surgeon and inadequate surgical facilities, these injuries may lead to high morbidity and mortality[5]. In a study, it was found that, for major BDIs, postoperative morbidity and mortality was 5.5% and 25%, respectively[6]. Complications of laparoscopic cholecystectomy should be the point of concern because the laparoscopic method is going to be used more frequently in coming years, particularly in a developing country such as India, where surgeons are still in initial phase of training in laparoscopic methods. It is important to understand incidence, type of injury, various method of corrections of such injury, prognosis of such injuries, etc., but, unfortunately, there is scarcity of these kinds of data in Indian patients.

The aim of the study is to know the risks, incidence, types, causes of

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BDIs, their timing and clinical presentations, various imaging modalities, and management by various methods.

### Materials and methods

An observational study was carried out on 100 patients at Department of General Surgery, Darbhanga Medical College and Hospital, Laheriasri, Bihar, India. All patients who underwent laparoscopic cholecystectomy with BDIs were observed and followed up. The study was conducted over a period of one year From July 2020 to June 2021 included all cases of BDI during this duration. Prior approval was obtained from the Institutional Ethics Committee. Informed written consent was obtained from each patient before participation in the study.

In all patients, the laparoscopic cholecystectomy was performed using four-port method. Cholecystectomy was performed with a standard technique. All surgeries were performed by faculty, either an assistant professor or a higher cadre. Imaging modalities to diagnose, detect level, and follow-up of cases of BDI and bile leak (BL) were ultrasonography (USG), computed tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP), magnetic resonance cholangiopancreatography (MRCP), and T-tube cholangiogram. Patients were divided in two groups—BDI and BL. Information regarding sociodemographic characteristics and other parameters were noted in predesigned pro forma.

All collected data was analyzed using Microsoft Excel. Descriptive statistics has been reported in the form of frequency and percentages.

### Results

A total of 100 patients were observed in the study period. The mean age of these patients was  $43.8 \pm 18.2$  years with a female preponderance. Majority of the patients were in fourth and fifth decades. Right hypochondriac pain along with nausea/vomiting was

the commonest presenting complaints. The most common cause of BDI was misidentification of CBD as cystic duct. [Table 1]

The conversion of laparoscopy to open surgery was done among 12 cases. In 9 cases, this was done because of BDI, and, in 3 cases, it was done because of short cystic duct with adhesions, inflammation, and difficulty in laparoscopy. BDI was observed in 5 patients and BL occurred in another 4 cases. Of 5 cases of BDI, 4 cases were detected intraoperative and 1 case was detected postoperatively. The cases detected at the time of surgery were managed surgically by end-to-end anastomosis over a T-tube and Roux-en-Y hepaticojejunostomy. Common signs and symptoms of BDI were abdominal pain, fever, jaundice, and raised alkaline phosphatase and serum bilirubin levels [Tables 2].

The initial imaging modality to detect BDI and BL was USG abdomen, which shows intrahepatic biliary radicals dilatation and sub-hepatic collection. T-tube cholangiogram was done in patient of

end-to-end anastomosis repair over T-tube on 14th postoperative day. If it showed minor anastomotic leakage and clear outlining of biliary tree, then T-tube was removed. ERCP was done to delineate the biliary anatomy and assess the level of injury. ERCP with stenting was done in patients presenting partial thickness injury of common bile duct (CBD). CT scan was done for detection of level of obstruction, extent of injury, and complete delineation of level of injury. In our study, those cases that showed CBD injury during intraoperative period were managed by end-to-end anastomosis over a T-tube repair using vicryl 4-0 sutures with follow-up T-tube cholangiogram after 14 days. Another case managed by Roux-en Y hepaticojejunostomy. All 4 cases that revealed BL from abdominal drain were kept conservative and managed by simple drainage. The patient who was detected postoperatively were managed by ERCP with stent [Table 3]. There was no mortality observed.

**Table 1: Distribution of patients based on demographic and clinical profile**

Patient characteristics	Number
<b>Age group</b>	
18-30 years	8
31-40 years	11
41-50 years	39
51-60 years	32
>60 years	10
<b>Gender</b>	
Male	33
Female	67
<b>Presenting sign/symptoms</b>	
Right hypochondrial tenderness	62
Nausea/vomiting	58
Guarding	44
Flatulent dyspepsia	39
Fever	24

**Table 2: Distribution of patients based on characteristics of BDI**

Characteristics of BDI	Number
<b>Types of BDI</b>	
CBD – full thickness	3
CBD – partial thickness	1
Bile leak	4
Cystic duct leak	1
<b>Clinical feature of BDI</b>	
Abdominal pain	7
Deranged LFT	6
Fever	6
Jaundice	6
Abdominal distension	2

**Table 3: Distribution of cases based on their diagnostic approach and treatment modality**

Management of cases	Number
<b>Diagnosis</b>	
USG	9
MRCP	6
T-tube cholangiogram	3
ERCP	1
CT scan	1
<b>Treatment</b>	
Conservative	4
End-to-end anastomosis over a T tube	3
ERCP with stent	1
Roux-en Y hepaticojejunostomy	1

**Discussion**

This observational study was conducted with the aim of understanding the nature, management, and prognosis of BDI and bile duct leak during laparoscopic cholecystectomy. 100 patients who underwent the surgery were monitored, and, in 9% patients, BDI/leak

was found. This incidence of BDI and leak is high when compared with many other studies published with similar objectives. In a study based on 1,522 laparoscopic cholecystectomies in Thailand, the BDI was found to be only 0.59%[7]. Many other studies found similar incidences of BDIs[8–10]. The main factor responsible for such

injuries is misinterpretation of anatomy of the bile duct. As surgeons get experienced, the chance of injuries decreases. Majority of these injuries are not recognized during the operation, but, in our study, half of the injuries were recognized and corrected during the operation, which led to no significant effect on mortality. Here, it is worth noting that such injuries cause a lot of economic burden and hamper quality of life of patients. BDIs and leaks may lead to significant morbidity and mortality[11].

In this study, all BDIs were repaired, and there was no mortality. These findings are better when compared with other studies, where some mortality was observed. In a review of 15 studies, it was reported that postoperative mortality was 2.7%[7]. In a study published in 1982, the mortality observed was much high (i.e., 8.6%)[12]. It seems that, with the time, the quality of surgery for BDIs are improved. Biliary leak was observed in around half of the cases of injuries in this study.

This leak is attributed to the pressure of sphincter of Oddi, which leads to the spillage of bile from vessels to outside. Investigations and surgical management used in this study were comparable to similar published studies[13].

This study has some limitations. The postoperative follow-up to identify complications of the surgery was not done; hence, no such data could be recorded. Such data are important, and future studies should include such data. In our center, majority of patients came from distant rural areas. Hence, complication data could not be collected.

#### Conclusion

The incidences of BDIs have decreased comparatively. The surgeon doing laparoscopic cholecystectomy should be aware about management of such injuries, and long-term follow-up should be done for such patients.

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