Research Article

A study of incidence and different treatment modalities for bile duct injury and bile leakage in 200 cases of laparoscopic cholecystectomy

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Abstract

Background: Bile duct injury (BDI) persists as the utmost problem of laparoscopic cholecystectomy (LC). LC is the standard of care for symptomatic cholelithiasis, but it is associated with a higher incidence of BDI than the open approach.

Objective: To know the risks, incidence, types, and causes of BDIs, their timing and clinical presentation, the various imaging modalities, and management by various methods.

Materials and Methods: The article summarizes the profile, nature, treatment, and prognosis of 200 patients of LC with BDIs seen in General Surgery and Gastrosurgical Department of Civil Hospital at Ahmedabad, Gujarat, India, from year 2006 to 2009.

Result: The conversion of LC to open surgery was done in 14 cases of difficult LC of 200 (7%) cases to avoid BDI. Of 14 cases of BDIs, six detected during surgery required laparotomy. Common bile duct transaction occurred in four (28.57%) cases. The most common symptom was right upper abdominal pain. Imaging modalities to diagnosis, detect level and follow up of cases of BDI and Bile leak (BL) were USG, CT scan, ERCP, MRCP, T-tube cholangiogram.

Conclusion: BDI remains the most serious complication of LC and causes significant morbidity and financial loss to the patient. Early recognition and adequate multidisciplinary approach are the cornerstones for the optimal final outcome.

KEY WORDS: Bile duct injury, bile duct leak, laparoscopic cholecystectomy, T-tube cholangiogram

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]

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Management of the cases of BDI and bile duct leaks is difficult and needs an experienced surgeon with the multi-disciplinary 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

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

Materials and Methods

This was a prospective, observational study carried out at Department of General Surgery and Gastro Surgery, Civil Hospital, Ahmedabad, which is a tertiary-care center of Gujarat. All patients who underwent laparoscopic cholecystectomy with BDIs were observed and followed up. The study was conducted from year 2006 to 2009. 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.

Statistical Analysis

Descriptive statistics was reported in the form of frequency and percentages.

Result

There were a total of 200 subjects observed in the study period. Peak incidence of calculous cholecystitis and biliary injuries was found to be in fourth and fifth decades. Higher incidence of calculous cholecystitis and biliary injuries was found in female subjects. Right hypochondriac pain and nausea/vomiting were the commonest symptoms and signs of cholecystitis. The most common cause of BDI is misidentification of CBD as cystic duct owing to anatomical variation, surgeon inexperience, and technical errors [Table 1].

The conversion of laparoscopy to open surgery was done in 20 (10%) cases. In 14 cases, this was done because of BDI, and, in six cases, it was done because of short cystic duct with adhesions, inflammation, and difficulty in laparoscopy. There were a total of eight (4%) cases of BDI and six (3%) cases of BL. Of eight cases of BDI, six cases were detected intraoperative and two cases detected postoperatively. The cases detected at the time of surgery were managed surgically by end-to-end anastomosis over a T-tube (two cases) 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 2–4].

The initial imaging modality to detect BDI and BL was USG abdomen, which shows intrahepatic biliary radicals dilatation and subhepatic 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 six cases that revealed BL from abdominal drain were kept conservative and managed by simple drainage. Two cases that were detected postoperatively were managed by ERCP with stent [Tables 5 and 6]. There was no mortality observed.

Table 1: Mode of presentation of 200 cases for laparoscopic cholecystectomy

Symptoms and signs	Frequency
Right upper abdominal pain	144
Nausea/vomiting	96
Flatulent dyspepsia	64
Fever	58
Right hypochondrium tenderness	138
Guarding	74

Table 2: Types of BDI (n = 14)

Types of injury	Frequency (%)
CBD-full thickness	4 (28.57)
CBD-partial thickness	2 (14.28)
Bile leak	6 (42.85)
Cystic duct leak	2 (14.28)

Table 3: Clinical features of BDI and BL (n = 14)

Clinical features in 14 cases of BDI	Frequency (%)
Abdominal pain	9 (64.28)
Fever	7 (50)
Jaundice	7 (50)
Abdominal distension	4 (28.57)
Drain removed—mean days	2.2
Altered liver function test	8 (57.14)
Raised total cholesterol	7 (50)

Table 4: Time of clinical presentation of BDI (*n* = 14)

Timing of injuries	Frequency (%)
Injury detected during surgery	6 (42.85)
Delayed identification requiring ERCP	2 (14.29)
Delayed identification treated conservatively	6 (42.85)

Table 5: Diagnostic procedures of BDI and BL (*n* = 14)

Diagnostic procedures	Frequency (%)
USG	14 (100)
ERCP	2 (14.28)
CT scan	2 (14.28)
T-tube cholangiogram	4 (28.57)
MRCP	7 (50)

Table 6: Treatment of BDI and BL (*n* = 14)

Treatment	Frequency (%)
Conservative	6 (42.85)
End-to-end anastomosis over a T-tube	4 (28.57)
ERCP with stent	2 (14.28)
Roux-en Y hepaticojejunostomy	2 (14.28)

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. Two hundred patients who underwent the surgery were monitored, and, in 14 (7%) 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, the high BDI rate may be because of less experience of the surgeons who had conducted the surgery.

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

On the basis of this study, it can be concluded that 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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