

# Cholecystoduodenal Fistula is not the Contraindication for Laparoscopic Surgery

Sanjeev Kumar Sareen

Director and Surgical Specialist, Sareen Hospital, Amritsar, Punjab, India

## ABSTRACT

Cholecystoduodenal fistula is the complication of gallstone and it is difficult to diagnose this condition preoperatively, which is the reason for conversion of laparoscopic to open cholecystectomy. Earlier laparoscopic cholecystectomy was considered unsuitable for such difficult bilioenteric procedures. The laparoscope is fast becoming an important tool for the general surgeon, it make us capable of handling the unforeseen events. This review article is to demonstrate the cholecystoduodenal fistula is not the contraindication for the laparoscopy, now it can be performed without higher rate of risk with the innovation of better modalities available.<sup>5</sup> The goal of study is to introduce the proper awareness in laparoscopic surgeons regarding the feasibility and safety of the procedure.

**Keywords:** Cholecystoduodenal fistula (CCDF), Cholelithiasis, Gallstone ileus, Safe laparoscopic repair.

## INTRODUCTION

Acute cholecystitis, acute pancreatitis, spontaneous gallbladder perforation, pericholecystic abscess, cholecystoduodenal fistula, gallstone ileus and intestinal obstruction are the complications of the gallstone disease.<sup>21</sup> Despite advanced perioperative care, morbidity and mortality are still high in such cases because of (i) geriatric age group, with (ii) multiple co-morbid conditions, (iii) prolonged undiagnosed cholecystoduodenal fistula and (iv) gallstone ileus, (v) fluid and electrolyte imbalance and (vi) late stage hospitalization.<sup>4</sup> Untreated cholecystoduodenal fistula will lead to passage of the gallstones in the second part duodenum and will require enterotomy as emergency along with major biliary surgery to overcome the complications caused by bowel occlusion. One stage laparoscopic surgery can be performed in such abdominal emergency conditions which include removal of impacted stones, repair of fistula and cholecystectomy. One stage surgery is good option; it can be done to avoid the future recurrence,<sup>1</sup> later biliary complications and reoperations in elderly old patients who usually have coexisting medical diseases, to prevent the morbidity and mortality.<sup>3,4,17</sup> CCDF will affect the duodenal bulb and cause peptic duodenal perforation leading to upper gastrointestinal (GI) bleeding.<sup>6</sup>

## AIMS AND OBJECTIVES

The cholecystoduodenal fistula is the rare complication of the cholelithiasis. The aim of the review study is to evaluate the safety and risk of complications when laparoscopic approach is applied in the cases of cholecystoduodenal fistula.

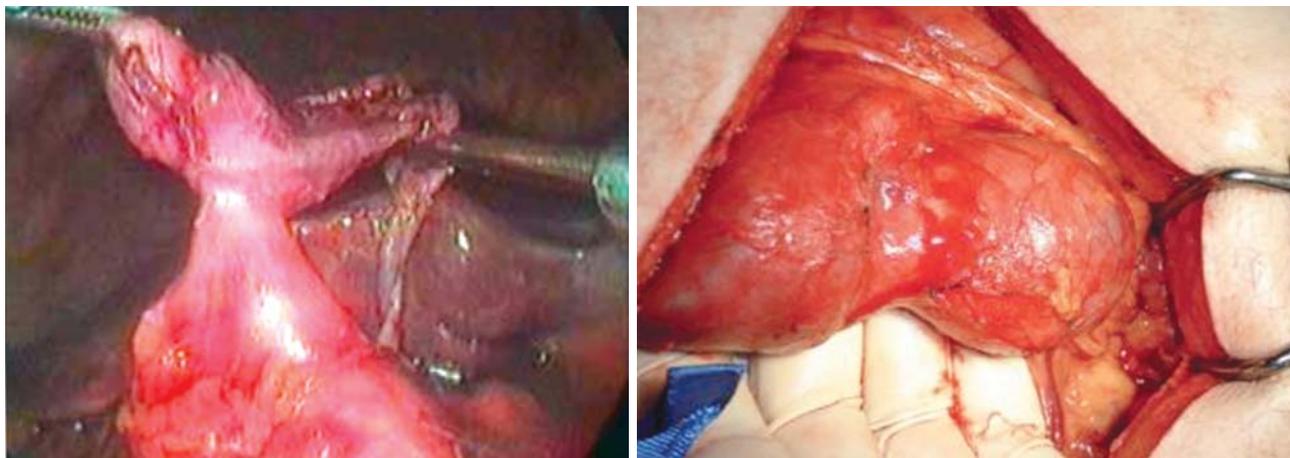
## MATERIALS AND METHODS

We analyzed review of many multicenter studies about laparoscopic cholecystoduodenal repair and laparoscopic cholecystectomy. A literature search is performed using different search engines, such as Google, Yahoo, SpringerLink, HighWire press, surgical endoscopy. Total 21 references from various international and national journals are selected for this review article. The authors of the various journal publications at different times collected the data commonly on basis of patient's age, sex, preoperative diagnoses, operative methods, morbidity and management for their studies. The criteria for selection were to reduce the risk of postoperative complications.

## CHOLECYSTODUODENAL FISTULA

The communication between the gallbladder and duodenum secondary to severe cholecystitis and cholelithiasis may lead to perforation and abscess formation (Fig. 1). The gallstones can erode into the second part of duodenum and bigger stones will cause gallstones ileus. Gallstone ileus is not the common cause of intestinal obstruction and was first described by Bartholin in 1654.

Cholecystoenteric fistulas are a rare complication of gallstone disease and affect 3 to 5% of patients with cholelithiasis. Most fistulas are diagnosed intraoperatively and often requires conversion to open surgery.<sup>12</sup> The study was conducted to evaluate the incidence of different types of internal biliary fistula (1.9%), incidence of upto 4.8%, which demonstrate that most common type was choledochoduodenal fistula (62%), followed by cholecystoduodenal fistula(19%), cholecystocholedochal (11%), cholecystocolonic fistula (8%). In most of the



**Fig.1:** The fistulous connection of gallbladder with the duodenum in cholecystoduodenal fistula<sup>14</sup>

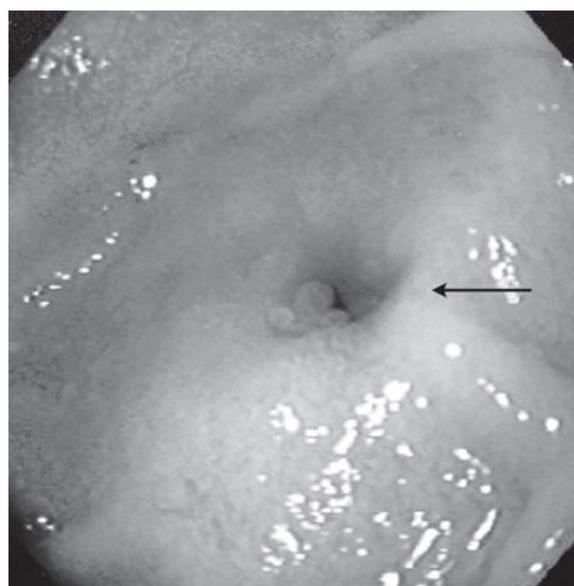
patients, the cause of these fistulas are biliary stone, in few cases by malignant tumors. All of the bile samples taken were bacteria-positive and the majority of the calculi were brown pigment stones. These fistulas were repaired using endoscopic stapling device without complications with laparoscopy.<sup>10</sup> Peptic duodenal perforation ulceration is the common cause for the upper GI bleeding, which will affect the duodenal bulb caused by CCDF and lead to spillage of gallstone into the second part of duodenum.<sup>6</sup>

Bouveret’s syndrome is a rare condition consisting in a duodenal obstruction due to the passage of gallstones from the gallbladder to the duodenum through a cholecysto-duodenal or cholecystogastric fistula. The fistula is a large, patulous opening, creating a continuation of the gallbladder and the duodenal bulb. The preoperative diagnosis of Bouveret’s syndrome is very difficult. The diagnosis was made on endoscopy, which allows visualization of the stone and the fistula also (Fig. 2). Fragmentation and removal

of the stone endosmotically is also a therapeutic option (Fig. 3).<sup>8</sup> The first laparoscopic cholecystectomy was performed by Mouret in 1987, and the scope of biliary surgery for the laparoscopic surgeon has increased now. There were several accepted contraindications for the laparoscopic surgery in the early stages; some of these were acute cholecystitis, morbid obesity, adherent gallbladder, jaundiced patients, ductal calculi and biliary tract anomalies. In the past, a lot of series of cases of the laparoscopic cholecystectomies incidental encounter of the cholecystoduodenal fistulae were seen. With increasing expertise and improved instrumentation, cholecystoduodenal fistula can be dealt with laparoscopic approach.<sup>7</sup> Biliary metallic stents related complications of migration, bile duct rupture; pressure necrosis by impacted calculi and food particles in cases of ampulla of Vater carcinoma reported and lead to CCDF.<sup>16</sup> Laparoscopic cholecystectomy is one of the commonest procedures being performed by the



**Fig.2:** The fistulous opening of within the duodenum



**Fig.3:** Endoscopic examination reveals the orifice of cholecysto-duodenal fistula (arrow), bile excretion into second part of the duodenum<sup>11</sup>

surgeons all over the world. High incidence of cholelithiasis combined with the lack of health care facilities and the lack of awareness on the part of the patient contributes to very common presentation of the patient in the advanced stage of the disease.

### INVESTIGATIONS

Barium study may reveal duodenal obstruction and repletion defects and site of cholecystoduodenal fistula, and good quality, high-resolution USG or CT may be helpful in revealing pneumobilia/aerobilia and lithiasis. As per Cooper et al (1987) and Kasano et al (1997) CT can demonstrate the gallbladder and the duodenum not to be separate and distinct structures (thickly adherent-mass formation), and contracted gallbladder with lot of adhesions (1998) (Fig. 4). Endoscopy has been the main diagnostic procedure in case of Bouverets syndrome in which gallstones can be seen in the duodenum.<sup>8</sup> MRI/MRCP, ERCP, cholangiography can be helpful in making the diagnosis (Fig. 5).

### ANESTHETIC CONSIDERATION

All the patients were given general anesthesia with endotracheal intubation, multipara close monitoring, IV line and proper fluid and electrolyte conduct the safe and secure laparoscopic procedures.

### OPERATIVE PROCEDURE

Usually all the patients for laparoscopy approach to the hospital with the anticipation of second day discharge. With the patient in supine position, general anesthesia induction with endotracheal tube was done. Sterile preparation and drapping of whole abdomen done. All the previous surgical scars should be considered in view of intra-abdominal adhesions which may lead to inadvertent injury to the viscera, such as gut. Two 10 mm and two 5 mm ports are made as routine cases for the laparoscopic cholecystectomy, one 10 mm umbilical and one 10 mm epigastric port and one 5 mm port in right subcostal and another 5 mm in the right anterior axillary line 7.5 cm apart on each side. Access to the peritoneal cavity to create the pneumoperitoneum may be difficult in the previously operated cases. In these cases, creating pneumoperitoneum by open technique (Hassan's technique) or use of veress needle through the Palmer's point (2 cm below the left costal margin in the midclavicular line) can be the useful alternatives to the umbilical port. The dissection should be done keeping in mind the anatomy of the hepatobiliary system and proceed step by step till the separation of gallbladder from duodenum, dissection of CCDF, removal of gallbladder and closure of fistula.

One should stay close to the liver margin, either medially or laterally to approach thickly adherent gallbladder and CCDF. Lifting the Hartmann's pouch early in the dissection

allows easier definition of the gallbladder/cystic duct junction and circumferential dissection around the cystic duct and cholecystoduodenal fistula (Fig. 6).

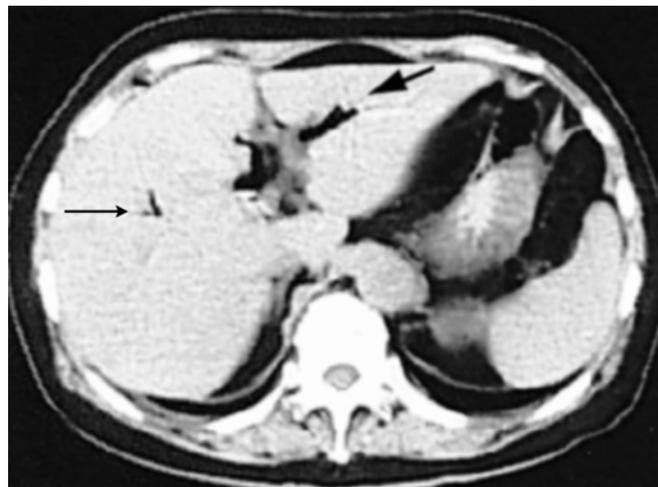


Fig.4: Computerized tomography shows pneumobilia (arrow)<sup>11</sup>

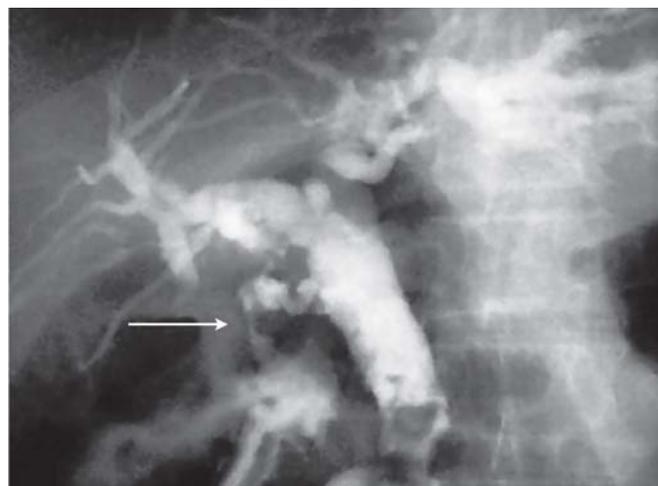


Fig.5: Endoscopic retrograde cholangiography reveals a dilated common bile duct including a multiple bile duct stone with cholecystoduodenal fistula (arrow)<sup>11</sup>

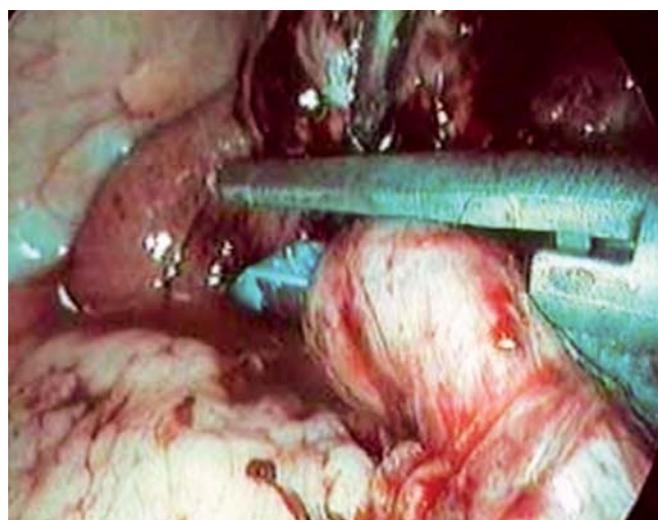


Fig.6: The cholecystoduodenal fistula was mobilized and divided using endoscopic linear stapling device<sup>14</sup>

Define gallbladder/cystic duct junction—surgical dissection of cystic duct and cystic artery should begin adjacent to or near the point of origin of cystic duct or near point of entry of the vessel. Identification of cystic lymph node as a landmark to define cystic duct and cystic artery. Calot's triangle—Dissection in Calot's triangle should be performed after identifying gallbladder/cystic duct junction. The tip of the curved dissector should be facing anterolaterally towards the gallbladder to avoid the injury to the liver or the CBD while dissecting the Calot's triangle.<sup>20</sup>

Proper localization of common bile duct should be done during surgery by retracting the duodenum downwards, retracting the right lobe of liver with proper traction to the Hartmann's pouch keeping in mind the plane of Rouviere's sulcus.

Maintain the plane of dissection in the cholecystic plate while removing the gallbladder from the liver. Dissection deeper in this plane may cause injury to the liver and cause troublesome bleeding while dissection superficial to this plane may cause perforation of the gallbladder and spillage of bile. Cholecystoduodenal fistula can be completely mobilized with a combination of blunt and sharp dissection and divided using the endoliner stapling device for the fistula closure. These fistulae were repaired laparoscopically using an endo-GIA 35 endoscopic stapling device. The endostapler can be used in few cases to transect the fistula and in other cases, the defect in the bowel can be repaired with intracorporeal sutures. In the other way, after division of the cystic duct and artery, the gallbladder was dissected from the liver bed, leaving just the fistulous connection to the duodenum. Then division of the fistula was completed using the same stapling device. The placement of additional trocar, frequent irrigation and suction, use of suction canula for dissection, use of gauze piece in case of minor bleed and adequate traction on the infundibulum of gallbladder to display structures in the Calot's triangle are useful aids to dissection. Every effort should be made to avoid the spillage of bile into the peritoneal cavity as this will increase the incidence of postoperative infection, abscess formation and also make the incidental stage 1 carcinoma into stage 4. The better outcome has been reported with the use of harmonic scalpel and fundus first technique in the recent studies.

### **INTRAOPERATIVE COMPLICATIONS, RISK FACTORS AND PRECAUTIONS TO AVOID THESE COMPLICATIONS**

All surgeons will encounter difficult cholecystectomies in their lifetime. Many cumbersome situations can be prevented or made easier by the cautious surgeon who has a carefully thought-out plan for each potential problem. One should proceed very slowly to counter the challenges that may be faced in beginning with diagnosis and continuing through

the operative procedure including the decision to operate, the best intervention, abdominal entry, dealing with common ductstones, proper careful dissection over the cholecystoduodenal fistula area for the separation from duodenum, intraoperative cholangiography, exposure of the biliary anatomy, avoidance of bleeding or common duct injury, spilled stones and postoperative bile collection. One should emphasize on prevention and management of inadvertent injuries.<sup>9</sup> The difficulty of laparoscopic cholecystectomy or the risk of conversion to open cholecystectomy can be predicted by assessing some preoperative variables.<sup>19</sup> The authors evaluated the efficacy of the risk score for conversion from laparoscopic to open cholecystectomy (RSCLO), which was recently developed by Kama et al (Am J Surg 2001;181:520). Safe dissection is the key to complete laparoscopic cholecystectomy successfully. Minimal use of electrocautery in Calot's triangle should be advocated. Adherence to the basic protocol of surgery and progressing step by step while following the landmarks of hepatobiliary anatomy. If the injury is detected intraoperatively and the necessary facilities with expert surgical team are available, then repair should be done in the same operation or put stent by ERCP in postoperative period.

### **Risk Factors**

The review by Strasburg et al in 1995 of approximately 124000 laparoscopic cholecystectomy reported in literature found the incidence of major bile duct injuries to 0.5%. In 1995, Strasberg and Soper modified the Bismuth classification of bile duct injury. Bile duct injury is the most catastrophic event that can happen to a patient undergoing surgery leaving the patient with high morbidity. In 1991, surgeons of French society of endoscopic and operative radiology reported 101 postoperative complications by laparoscopic surgery (morbidity 3.2%) 42 biliary and 59 nonbiliary, 18 bile duct injuries and six deaths (0.2%) reported out of 2955 laparoscopic cholecystectomies.<sup>18</sup> The duodenal injuries, gastric injuries, colonic injuries, vascular injuries are very common. One should be very careful in such cases with complicated gallstone disease to avoid any disastrous complication which can result in biliary cripples.

### **Complications of the Disease**

Peptic duodenal perforation ulceration is the common cause for the upper gastrointestinal bleeding, which will affect the duodenal bulb. Bouveret's syndrome is a rare entity consisting in a duodenal obstruction due to the passage of gallstones from the gallbladder (gallstone ileus) to the duodenum through a cholecystoduodenal or cholecystogastric fistula. Associated cases of Mirizzi syndrome with cholecystoduodenal fistula will lead to biliary leakage and biliary peritonitis and septicemia.

## Contraindication for Laparoscopic Procedure

The Mirizzi syndrome refers to common hepatic duct obstruction caused by an extrinsic compression from an impacted stone in the cystic duct. It is often not recognized preoperatively, which can lead to significant morbidity and biliary injury, biliary leakage and biliary peritonitis due to distorted anatomy in laparoscopic surgery.

## RESULTS

In 1991, Miguel Velez et al (surgical endoscopy) reported a case of successful laparoscopic repair of cholecystoduodenal fistula incidentally noticed in cholecystectomy.<sup>2</sup>

In 1999, Yashimota et al performed the laparoscopic surgery of cholecystoduodenal fistula and cholelithiasis. With the use of a flexible HD video scope, flexible retractor and endoscopic transecting stapler, laparoscopic treatment of cholecystoenteric fistulae was performed.<sup>15</sup>

In 2000, Scott et al treated two middle aged women having acute exacerbations of chronic gallbladder disease with laparoscopic surgery. A cholecystoduodenal fistula diagnosed intraoperatively in each case. These fistulae were repaired laparoscopically using an endoscopic stapling device without complication. Each patient did well postoperatively and was discharged on the second postoperative day in good condition.<sup>10</sup>

In 2001, Moreno et al conducted study on laparoscopic biliary pathology from 1992 to 1999 (191 emergency and 877 elective surgeries). A total of 302 cases (28%) were of complicated biliary pathology; out of these they reported 14 cholecystoduodenal fistulae, three cholecystocolonic fistulae and two cholecystogastric fistulae. Only in five patients with cholecystoduodenal fistula, the operation was successfully completed by laparoscopy. Conversion to open surgery was because of bleeding (5 cases), difficulty for colon suture (2 cases) and inflammation of the gallbladder with the duodenum (7 cases). An endo-GIA 35 was used to transect the fistula. All patients were discharged after 4 or 5 days without wound infection, and they have been evaluated at 3 and 12 months without problems.<sup>5</sup>

In 2006, Chikamori et al (Japan) reported a case of cholecystocholedocholithiasis with cholecystoduodenal fistula diagnosed preoperatively and treated with a combined approach endoscopic sphincterectomy for the multiple CBD stones and laparoscopic cholecystectomy and cholecystofistulectomy with the help of endoscopic linear stapling devices for the fistula closure. They concluded that laparoscopic cholecystofistulectomy by skilled laparoscopic surgeons can be adopted as a first-choice treatment for cholecystoduodenal fistula.<sup>11</sup>

In 2003, El Dhuwaib et al conducted study on gallstone ileus and small bowel obstruction in elderly women. The enterolithotomy and cholecystectomy have been performed

laparoscopically with closure of the cholecystoduodenal fistula. In the risky patient, staged laparoscopic management of gallstone ileus and the associated cholecystoduodenal fistula is feasible and seems to be safe. In high risk cases, imaging of the biliary tree is must to detect silent choledocholithiasis, which also can be managed along with and safely by the laparoscopic and endoscopic approach.<sup>14</sup>

In a series of 300 laparoscopic cholecystectomies, the authors encountered five cholecystoduodenal fistulae. It was possible to manage four fistulae laparoscopically. Two patients underwent a laparotomy, one for a failed laparoscopic repair of cholecystoduodenal fistula and the other for several common bile duct (CBD) stones, which could not be removed laparoscopically via the cystic duct. Most cases of cholecystoduodenal fistula could be dealt with increasing expertise and improved instrumentation.<sup>7</sup>

In 2007, Maciej et al conducted a study in which 56-year-old woman with past history of 20 years colic pain in right hypochondriac region diagnosed as case of cholelithiasis. Laparoscopic cholecystectomy was initiated, but following the diagnosis of cholecystoduodenal fistulas, it was converted to an open cholecystectomy, postoperative recovery was without complication. Cholangiography performed one week after surgery showed residual choledocholithiasis.<sup>13</sup>

In 2006, Chowbey et al study was conducted to assess the use of different suturing modes. The operation could be completed laparoscopically in 59 patients. An endostapler was used in 47 patients to transect the fistula and in 12 patients the defect in the bowel was repaired with intracorporeal sutures. The mean postoperative hospital stay was 5.2 days. All the patients are asymptomatic at a mean follow-up of 2.4 years.<sup>12</sup>

In 2010, Azra lactic et al reported five cases of CCDF diagnosed intraoperatively, managed successfully by laparoscopic approach. During the 3-year period, from 2007 to 2009, 1500 patients underwent laproscopic cholecystectomy for gallstone disease, only five of them (3.3%), who presented with routine symptoms of symptomatic cholelithiasis, intraoperatively CCDF were found. Laparoscopic surgery was performed using the standard three trocars technique. All patients were females, 67 years old on average. In three cases, CCDF was completely mobilized with a combination of blunt and sharp dissection and divided using the endolinear stapling device. In the other two cases after division of the cystic duct and artery, the gallbladder was dissected from the liver bed, leaving just the fistulous connection to the duodenum. Then division of the fistula was completed using the same stapling device. All five patients had uneventful postoperative course. The hospital stay of five patients ranged from 5 to 10 days (median 6 days).<sup>4</sup>

## DISCUSSION

After introduction of laparoscopy cholecystectomy in late decade of 1980, the field of general surgery was revolutionized. Many articles about successful laparoscopic repair of CCDF have been written. It was found that laparoscopy has many benefits to patients' life—less pain, less blood loss during operation decrease hospital stay, morbidity, earlier return to normal activities and cosmesis. After review, many articles about cholecystoduodenal fistula and risk factor of injuries and their proper management and long-term better effect on quality of life. It is a good option for treatment of symptomatic gallstone disease, complicated gall bladder diseases and cholecystoduodenal fistula. With more experience and improved techniques, most of these cases could be performed laparoscopically, with all of the advantages of minimally invasive surgery.<sup>4</sup> The Cholecystoenteric/Cholecystoduodenal fistula is a difficult problem usually diagnosed intraoperatively. A high degree of suspicion at operation is mandatory. A stapled cholecystofistulectomy may be the procedure of choice, since it avoids contamination of the peritoneal cavity. Complete laparoscopic management of cholecystoenteric/cholecystoduodenal fistula is possible in well-equipped centers.<sup>12</sup>

## CONCLUSION AND RECOMMENDATION

Laparoscopic surgery has become the standard care for the cases of benign gallbladder diseases. Cholecystoduodenal fistula can no longer be considered a contraindication for laparoscopic treatment, and it does not increase morbidity risk. The cholecystoduodenal fistula does not preclude a laparoscopic approach. With more and more endeavors being made in the field of laparoscopy, more and more complicated cases which were relatively contraindicated a few years ago are now being tackled laparoscopically. We feel that laparoscopic repair is a safe and effective approach in the hands of surgeons with significant laparoscopic experience.

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