International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 22-10-2019; Accepted: 18-11-2019; Published: 24-11-2019
www.medicalsciencejournal.com
Volume 5; Issue 11; 2019; Page No. 303-309

Surgical evaluation of common bile duct injury in patients undergoing laparoscopic cholecystectomy

Dr. Prem Prakash[1], Dr. Ashok Kumar Jha[2*]
[1] Medical Officer, Department of Surgery, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India
[2] Associate Professor, Department of Surgery, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India
[*] Corresponding Author: Dr. Ashok Kumar Jha

Abstract
Bile duct injury (BDI) is one of the dreaded major complications after cholecystectomy causing significant morbidity and mortality to the patient. Its incidence following open cholecystectomy is 0.2% to 0.3% whereas that following laparoscopic cholecystectomy is 0.6%. Bile duct anomalies, nature of gall bladder disease and surgeon's experience all contribute to bile duct injury. Injuries often occur due to misperceptions of normal anatomy than lack of knowledge, skill, or judgment. Other causes include a short cystic duct, significant inflammation, previous scar or adhesions and bleeding obscuring the field of vision. Hence based on above findings the present study was planned for Surgical Evaluation of Common Bile Duct Injury in Patients Undergoing Laparoscopic Cholecystectomy.
The present study was planned in multiple hospitals in Bihar. The 50 patients undergoing elective laparoscopic cholecystectomy were enrolled in the present study. Patients of both sexes were enrolled in the present study. At presentation, information regarding the cholecystectomy (preoperative symptoms, indication for surgery, preoperative evaluation, operative details, intraoperative complications, and postoperative events) was obtained by reviewing the medical records, interviewing the patient, and by discussing with the surgeon who operated whenever deemed necessary.
The data generated from the present study concludes that Bile duct injury is more common following laparoscopic cholecystectomy. Laparoscopic cholecystectomy is a procedure of choice in uncomplicated cases with minimum complications and early recovery, shorter hospital stay and early mobilization.

Keywords: common bile duct injury, laparoscopic cholecystectomy, etc

Introduction
Approximately 700,000 cholecystectomies are performed annually in the United States. Most are performed to address symptoms related to biliary colic from cholelithiasis, to treat complications of gallstones (eg, acute cholecystitis and biliary pancreatitis), or as incidental cholecystectomies performed during other open abdominal procedures.
Currently, most cholecystectomies are done via the laparoscopic approach; however, the open technique is sometimes required [1]. Accordingly, it is important for surgeons to be exposed to this technique during training [2].
Prophylactic cholecystectomy at the time of a splenorenal shunt has been proposed on the basis of the acute pain syndrome that these patients can develop postoperatively, which is often related to gallbladder symptoms, as well as the high likelihood of the formation of gallstones in this subset of patients with liver disease.
The procedure of choice for most of these indications has shifted from an open approach to a laparoscopic approach. However, some situations still require a traditional open cholecystectomy. Depending on the clinical situation, the procedure can either begin as an open operation or be converted to an open procedure from a laparoscopic one.
When gallbladder cancer is suspected or confirmed preoperatively or intraoperatively, an open cholecystectomy should be performed with consultation from an experienced hepatobiliary surgeon if the primary surgeon is not comfortable with liver resections and hepatobiliary surgery. If the necessary expertise is not available, the patient can be referred to a hepatobiliary surgeon for reexploration, given that prior exploration, either laparoscopic or open, does not appear to adversely affect long-term survival [3].
The recommendation for open cholecystectomy for gallbladder cancer, however, remains somewhat problematic, in that most gallbladder cancers are discovered incidentally during surgery or in the specimen [4, 5].
Open cholecystectomy should also be considered in patients with cirrhosis and bleeding disorders, as well as pregnant patients. In patients with advanced cirrhosis and bleeding disorders, potential bleeding may be difficult to control laparoscopically, and an open approach (or a percutaneous cholecystostomy tube) may be more prudent. Also, patients with portal hypertension often have a recannulized umbilical vein, and placing ports in these patients may cause significant hemorrhage.
Although laparoscopic cholecystectomy has been proved to be safe in all trimesters of pregnancy, as well as possibly associated with fewer maternal and fetal complications [6], an open operation should be considered for pregnant patients, especially in the third trimester, because laparoscopic port placement and insufflation may be difficult.
Open cholecystectomy is also indicated, albeit infrequently, in patients who have trauma to the right upper quadrant and in the rare cases of penetrating trauma to the gallbladder.
Most open cholecystectomies result from conversion of a

laparoscopic procedure, often because of bleeding complications or unclear anatomy. Conversion rates for laparoscopic cholecystectomy vary widely, with a reported range of 1-30% [7]. However, most series report the incidence of conversion to be lower than 10%, and some series report figures closer to 1-2%. In a study by Ibrahim *et al*, predictors of conversion to open cholecystectomy included age greater than 60 years, male sex, weight exceeding 65 kg, the presence of acute cholecystitis, previous upper abdominal surgery, the presence of diabetes and high glycosylated hemoglobin levels, and a less experienced surgeon [8].

In a study by Licciardello *et al*, [9] risk factors for conversion on univariate analysis included increased age; acute cholecystitis; comorbidities; elevated white blood cell count; and increased levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), gamma glutamyl transpeptidase, C-reactive protein (CRP), and fibrinogen. On multivariate logistic regression analysis, acute cholecystitis and age greater than 65 years were found to be independent predictive factors for conversion.

Sutcliffe *et al*, using data from a prospective UK database of 8820 patients, developed a validation risk score designed for preoperative identification of patients at high risk for conversion from laparoscopic to open cholecystectomy [10]. This score was derived from the following six significant predictors: age, sex, indication for surgery, American Society of Anesthesiologists (ASA) score, thick-walled gallbladder, and common bile duct (CBD) diameter. A score higher than 6 identified patients likely to require conversion. Finally, in lower-income countries, open cholecystectomy may be more cost-effective than the laparoscopic equivalent and may therefore be preferred on that basis.

Absolute contraindications for proceeding with an open cholecystectomy are few. Such absolute contraindications are limited to severe physiologic derangement or cardiopulmonary disease that prohibits general anesthesia. In cases of terminal illness, temporizing procedures such as percutaneous transhepatic cholangiography or percutaneous cholecystostomy should be considered in lieu of cholecystectomy. Pain and complications caused by gallstones are the most common reasons for removal of the gallbladder the gallbladder can also be removed in order to treat biliary dyskinesia or gallbladder cancer.

Gallstones are very common but 50–80% of people with gallstones are asymptomatic and do not need surgery; their stones are noticed incidentally on imaging tests of the abdomen (such as ultrasound or CT) done for some other reason [7]. Of the more than 20 million people in the US with gallstones, only about 30% will eventually require cholecystectomy to relieve symptoms (pain) or treat complications [11].

Biliary colic, or pain caused by gallstones, occurs when a gallstone temporarily blocks the bile duct that drains the gallbladder. Typically, pain from biliary colic is felt in the right upper part of the abdomen, is moderate to severe, and goes away on its own after a few hours when the stone dislodges. Biliary colic usually occurs after meals when the gallbladder contracts to push bile out into the digestive tract. After a first attack of biliary colic, more than 90% of people will have a repeat attack in the next 10 years. Repeated attacks of biliary colic are the most common reason for removing the gallbladder, and lead to about 300,000 cholecystectomies in the US each year [11].

Cholecystitis, or inflammation of the gallbladder caused by interruption in the normal flow of bile, is another reason for cholecystectomy. It is the most common complication of gallstones; 90-95% of acute cholecystitis is caused by gallstones blocking drainage of the gallbladder. If the blockage is incomplete and the stone passes quickly, the person experiences biliary colic. If the gallbladder is completely blocked and remains so for a prolonged period, the person develops acute cholecystitis.

Pain in cholecystitis is similar to that of biliary colic, but lasts longer than 6 hours and occurs together with signs of infection such as fever, chills, or an elevated white blood cell count. People with cholecystitis will also usually have a positive Murphy sign on physical exam - meaning that when a doctor asks the patient to take a deep breath and then pushes down on the upper right side of their abdomen, the patient stops their inhalation due to pain from the pressure on their inflamed gallbladder. 5-10% of acute cholecystitis occurs in people without gallstones, and for this reason is called acalculous cholecystitis. It usually develops in people who have abnormal bile drainage secondary to a serious illness, such as people with multi-organ failure, serious trauma, recent major surgery, or following a long stay in the intensive care unit [12].

People with repeat episodes of acute cholecystitis can develop chronic cholecystitis from changes in the normal anatomy of the gallbladder. This can also be an indication for cholecystectomy if the person has ongoing pain.

Cholangitis and gallstone pancreatitis are rarer and more serious complications from gallstone disease. Both can occur if gallstones leave the gallbladder, pass through the cystic duct, and get stuck in the common bile duct. The common bile duct drains the liver and pancreas, and a blockage there can lead to inflammation and infection in both the pancreas and biliary system. While cholecystectomy is not usually the immediate treatment choice for either of these conditions, it is often recommended to prevent repeat episodes from additional gallstones getting stuck. Gallbladder cancer (also called carcinoma of the gallbladder) is a rare indication for cholecystectomy. In cases where cancer is suspected, the open technique for cholecystectomy is usually performed.

In living donor liver transplantation between adults, a cholecystectomy is performed in the donor because gallbladder interferes with removal of the right (lateral) lobe of the liver and to prevent the formation of gallstones in the recipient. The gallbladder is not removed in pediatric transplantations as the left lobe of the liver is used instead [17].

There are no specific contraindications for cholecystectomy, and in general it is considered a low-risk surgery. However, anyone who cannot tolerate surgery under general anesthesia should not undergo cholecystectomy. People can be split into high and low risk groups using a tool such as the ASA physical status classification system. In this system, people who are ASA categories III, IV, and V are considered high risk for cholecystectomy. Typically, this includes very elderly people and people with co-existing illness, such as end-stage liver disease with portal hypertension and whose blood does not clot properly. Alternatives to surgery are briefly mentioned below.

All surgery carries risk of serious complications including damage to nearby structures, bleeding, infection, or even

death. The operative death rate in cholecystectomy is about 0.1% in people under age 50 and about 0.5% in people over age 50. The greatest risk of death comes from co-existing illness like cardiac or pulmonary disease [13].

A serious complication of cholecystectomy is biliary injury, or damage to the bile ducts. Laparoscopic cholecystectomy has a higher risk of bile duct injury than the open approach, with injury to bile ducts occurring in 0.3% to 0.5% of laparoscopic cases and 0.1% to 0.2% of open cases. In laparoscopic cholecystectomy, approximately 25-30% of biliary injuries are identified during the operation; the rest become apparent in the early post-operative period.

Damage to the bile ducts is very serious because it causes leakage of bile into the abdomen. Signs and symptoms of a bile leak include abdominal pain, tenderness, fever and signs of sepsis several days following surgery, or through laboratory studies as rising total bilirubin and alkaline phosphatase. Complications from a bile leak can follow a person for years and can lead to death. Bile leak should always be considered in any patient who is not recovering as expected after cholecystectomy. [Most bile injuries require repair by a surgeon with special training in biliary reconstruction. If biliary injuries are properly treated and repaired, more than 90% of patients can have a long-term successful recovery. Injury of the bile ducts can be prevented and treated by routinely using X-ray investigation of the bile ducts (intraoperative cholangiography (IOC)). This method was assessed by the Swedish SBU and routine use deemed to decrease risk of injury and morbidity following unaddressed injury while only increasing cancer rates due to radiation exposure by a lesser fraction [14].

The same study found the prevalence of bowel injury, sepsis, pancreatitis, and deep vein thrombosis/pulmonary embolism to be around 0.15% each. Leakage from the stump of the cystic duct is a complication that is more common with the laparoscopic approach than the open approach but is still rare, occurring in less than 1% of procedures; it is treated by drainage followed by insertion of a bile duct stent. Experts agree that many biliary injuries in laparoscopic cases are caused by difficulties seeing and identifying the anatomy clearly. If the surgeon has problems identifying anatomical structures, they might need to convert from laparoscopic to open cholecystectomy. CBDS are found in 10-15% of patients during cholecystectomy when intraoperative cholangiography (IOC) is routinely performed [25, 26]. There are several strategies to manage choledocholithiasis but the optimal method as well as the timing of treatment is still under debate [15].

In recent years the LERV technique, in which access to the common bile duct by ERCP is facilitated by an antegrade guidewire, which is intraoperatively introduced during fluoroscopy and is advanced through the cystic duct to the duodenum, has been established as an alternative to treat common bile duct stones discovered during laparoscopic cholecystectomy. This technique was first described in 1993 by Deslandres *et al*. [16] and has, in several studies, been shown to have a high rate of CBD stones clearance and a reduced number of complications, particularly post-ERCP pancreatitis, in comparison with conventional ERCP. This is probably due to the facilitated access to the common bile duct with a lesser degree of manipulation and trauma to the papilla Vateri. In a study by Swahn *et al*. the rendezvous method was shown to reduce the risk of PEP from 3.6 to 2.2% compared with conventional biliary cannulation [17]. The success rate of passing the transcystic guide wire into the duodenum has been reported to be over 80%.

Before surgery, a complete blood count and liver function tests are usually obtained. Prophylactic treatment is given to prevent deep vein thrombosis. Use of prophylactic antibiotics is controversial; however, a dose may be given prior to surgery to prevent infection in certain people at high risk. Gas may be removed from the stomach with an OG or NG tube. A Foley catheter may be used to empty the patient's bladder.

Laparoscopic cholecystectomy uses several (usually 4) small incisions in the abdomen to allow the insertion of operating ports, 5 to 10 mm in diameter, through which surgical instruments are placed into the abdominal cavity. The laparoscope, an instrument with a video camera and light source at the end, illuminates the abdominal cavity and sends a magnified image from inside the abdomen to a video screen, giving the surgeon a clear view of the organs and tissues. The cystic duct and cystic artery are identified and dissected, then ligated with clips and cut in order to remove the gallbladder. The gallbladder is then removed through one of the ports. As of 2008, 90% of cholecystectomies in the United States were done laparoscopically. Laparoscopic surgery is thought to have fewer complications, shorter hospital stay, and quicker recovery than open cholecystectomy.

Single incision laparoscopic surgery (SILS) or laparoendoscopic single site surgery (LESS) is a technique in which a single incision is made through the navel, instead of the 3-4 four small different incisions used in standard laparoscopy. There appears to be a cosmetic benefit over conventional four-hole laparoscopic cholecystectomy, and no advantage in postoperative pain and hospital stay compared with standard laparascopic procedures. There is no scientific consensus regarding risk for bile duct injury with SILS versus traditional laparoscopic cholecystectomy [18].

Natural orifice transluminal endoscopic surgery (NOTES) is an experimental technique where the laparoscope is inserted through natural orifices and internal incisions, rather than skin incisions, to access to the abdominal cavity. This offers the potential to eliminate visible scars. Since 2007, cholecystectomy by NOTES has been performed anecdotally via transgastric and transvaginal routes. As of 2009 the risk of gastrointestinal leak, difficulty visualizing the abdominal cavity and other technical limitations limited further adoption of NOTES for cholecystectomy.

In open cholecystectomy, a surgical incision of around 8 to 12 cm is made below the edge of the right rib cage and the gallbladder is removed through this large opening, typically using electrocautery. Open cholecystectomy is often done if difficulties arise during a laparascopic cholecystecomy, for example, the patient has unusual anatomy, the surgeon cannot see well enough through the camera, or the patient is found to have cancer. It can also be done if the patient has severe cholecystitis, emphysematous gallbladder, fistulization of gallbladder and gallstone ileus, cholangitis, cirrhosis or portal hypertension, and blood dyscrasias.

After removal, the gallbladder should be sent for pathological examination to confirm the diagnosis and look for any incidental cancer. Incidental cancer of the gallbladder is found in approximately 1% of cholecystectomies. If cancer is present in the gallbladder, it is usually necessary to re-operate to remove parts of the

liver and lymph nodes and test them for additional cancer.

After surgery, most patients are admitted to the hospital for routine monitoring. For uncomplicated laparoscopic cholecystectomies, people may be discharged on the day of surgery after adequate control of pain and nausea. Patients who were high-risk, those who required emergency surgery, and/or those undergoing open cholecystectomy usually need to stay in the hospital several days after surgery. In 95% of people undergoing cholecystectomy as treatment for simple biliary colic, removing the gallbladder completely resolves their symptoms.

Up to 10% of people who undergo cholecystectomy develop a condition called postcholecystectomy syndrome. Symptoms are typically similar to the pain and discomfort of biliary colic with persistent pain in the upper right abdomen and commonly include gastrointestinal distress (dyspepsia) [19].

Some people following cholecystectomy may develop diarrhea. The cause is unclear, but is presumed to be due to disturbances in the biliary system that speed up enterohepatic recycling of bile salts. The terminal ileum, the portion of the intestine where these salts are normally reabsorbed, becomes overwhelmed, doesn't absorb everything, and the person develops diarrhea. Most cases resolve within weeks or a few months, though in rare cases the condition can last for years. It can be controlled with medication such as cholestyramine.

It is generally safe for pregnant women to undergo laparoscopic cholecystectomy during any trimester of pregnancy. Early elective surgery is recommended for women with symptomatic gallstones to decrease the risk of spontaneous abortion and pre-term delivery. Without cholecystectomy, more than half of such women will have recurrent symptoms during their pregnancy, and nearly one in four will develop a complication, such as acute cholecystitis, that requires urgent surgery. Acute cholecystitis is the second most common cause of acute abdomen in pregnant women after appendectomy.

Porcelain gallbladder (PGB), a condition where the gallbladder wall shows calcification on imaging tests, was previously considered a reason to remove the gallbladder because it was thought that people with this condition had a high risk of developing gallbladder cancer. However, recent studies have shown that there is no strong association between gallbladder cancer and porcelain gallbladder, and that PGB alone is not a strong enough indication for a prophylactic cholecystectomy. There are several alternatives to cholecystectomy for people who do not want surgery, or in whom the benefits of surgery would not outweigh the risks.

Conservative management for biliary colic involves a "watch and wait" approach—treating symptoms as-needed with oral medications. Experts agree that this is the preferred treatment for people with gallstones but no symptoms. Conservative management may also be appropriate for people with mild biliary colic, as the pain from colic can be managed with pain medications like NSAIDS (ex: ketorolac) or opioids [1].

Conservative management for acute cholecystitis involves treating the infection without surgery. It is usually only considered in patients at very high risk for surgery or other interventions listed below. It consists of treatment with intravenous antibiotics and fluids.

Bile duct injury (BDI) is one of the dreaded major complications after cholecystectomy causing significant morbidity and mortality to the patient. Its incidence following open cholecystectomy is 0.2% to 0.3% whereas that following lapa¬roscopic cholecystectomy is 0.6%. Bile duct anomalies, nature of gall bladder disease and surgeon's experience all contribute to bile duct injury. Injuries often occur due to misperceptions of normal anatomy than lack of knowledge, skill, or judgment. Other causes include a short cystic duct, significant inflammation, previous scar or adhesions and bleeding obscuring the field of vision. Hence based on above findings the present study was planned for Surgical Evaluation of Common Bile Duct Injury in Patients Undergoing Laparoscopic Cholecystectomy.

Methodology

The present study was planned in multiple hospitals in Bihar. The 50 patients undergoing elective laparoscopic cholecystectomy were enrolled in the present study. Patients of both sexes were enrolled in the present study. At presentation, information regarding the cholecystectomy (preoperative symptoms, indication for surgery, preoperative evaluation, operative details, intraoperative complications, and postoperative events) was obtained by reviewing the medical records, interviewing the patient, and by discussing with the surgeon who operated whenever deemed necessary.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: patients undergoing elective laparoscopic cholecystectomy.

Exclusion Criteria: patients with history of cholangitis, acute pancreatitis, proven common bile duct stones, surgical obstructive jaundice, cholecysto-enteric fistula, malignancy, portal hypertension and severe cardiac or pulmonary disease.

Results & Discussion

Bile duct injury is a major and potentially life-threatening complication of cholecystectomy. Open and laparoscopic cholecystectomy are main therapeutic options for patients with gall stones. latter being associated with less morbidity, shorter hospital stay, earlier return to normal activity and less postoperative pain as compared to former. The incidence of bile duct injury has increased from 0.1 to 0.2% for open cholecystectomy and from 0.4% to 0.6% for laparoscopic cholecystectomy. Bile duct injuries are classified as leak, stricture, complete transection and excision of a segment of duct and ligation of a major bile duct. Bile duct injuries can be caused by erroneous cutting of bile ducts, accidentally misplaced clips, laceration, occlusion or peri ductal leakage due to thermal injury by electrocautery leading to fibrosis [20, 22].

The main function of biliary tract is to collect, storage and delivery of bile to gastrointestinal tract. The bile is produced in the liver which is then secreted in to small bile ducts which combine to form the common hepatic duct. The cystic duct which drains collected bile in gallbladder combines with common hepatic duct to form common bile duct which ultimately drains the bile in to GIT. However, this anatomy of the biliary system is very much complex

and there are lots of variations in it. Therefore, utmost care should be taken during any operative procedure of hepatobiliary system to avoid bile duct injury. Because bile duct injury can lead to lifelong disability or even death, iatrogenic bile duct injury therefore should promptly be identified and repaired or the patient should be referred to the specialist who has expertise in hepatobiliary surgery [23].

Table 1: Demographic Details

Parameters	No. of Cases
Age	
20 – 30 years	2
31 – 40 years	12
41 – 50 years	18
51 – 60 years	11
61 & above years	7
Sex	
Males	15
Females	35
Total	50

Table 2: Intra Operative Complications

Parameters	No. of Cases
Common Duct Injury (Cystic Duct)	3
Bowel Injury	3
Bile Spillage from Gall Bladder	5
Stone Spillage	2

Table 3: Major symptoms

Parameters	No. of Cases
Pain Right Hypochondrium	25
Fatty dyspepsia + Pain	22
Flalutence + Nausea	13
Nausea + Pain + Dyspepsia	11

Table 4: Post-Operative Syndrome

Parameters	No. of Cases
Bile leak from drain	3
Haemorrhage	1
Bowel injury causing Fistula	1
Mortality	1

Cystic duct may join common bile duct at the acute angle, travel parallel to common bile duct for several centimeters, insert into the right hepatic duct or congenitally absent. Most challenging consideration is short cystic duct, for it is in this setting the common bile duct is most likely injured. Rarely right hepatic duct arises off the cystic duct [24, 25]. Cystic artery arises from right hepatic artery; one must be absolutely sure that the cystic artery is visualized entering the gall bladder wall and is controlled near the gall bladder. Right hepatic artery may loop onto the surface of gall bladder and there may be very short cystic artery, if dissection is incomplete then there is likelihood of ligation right hepatic artery. There may be early branching of cystic artery with the other branches often found in a posterior location, occasionally cystic artery is found to the right of the cystic duct. Common bile duct begins at the junction of cystic duct and common hepatic duct and traverses inferiorly to the ampulla of vater, normally 6mm diameter. Common bile duct begins at the junction of cystic duct and common hepatic duct and traverses inferiorly to the ampulla of vater, normally 6mm diameter.

Accessory hepatic ducts or small bile duct may enter the gall bladder directly from its bed. There are small biliary radicals in the superficial liver parenchyma of the gall bladder bed; if these ducts are damaged, they may cause postoperative bilioma. So, some patients with obscure anatomy may need Laparoscopic ultrasound for mapping biliary and vascular anatomy and is superior to operative cholangiogram. (From infundibulum or cystic duct). Literatures also mentions that Intraoperative cholangiogram is ineffective at lowering the rate of biliary injuries [26].

The initial treatment of these patients depends on the type of injury and the time of its recognition. Therefore, it is essential to determine the morphological details of the injury and define the anatomy of proximal biliary tree; this would determine strategy for biliary reconstruction and significantly affect the long-term prognosis [27].

Bile duct injury can be diagnosed by clinical history and examination and must be confirmed by imaging for planning further management. Blood investigations like complete blood count, renal function test and liver function test indicate presence of sepsis, organ failure and malnutrition. USG abdomen is the initial imaging modality of choice. It has good sensitivity in detecting biloma and dilated biliary radicals. It also helps in the management of biloma with image guided percutaneous catheter drainage [28].

Various studies have shown that the no of bile duct injury has declined over time and according to some author, the referral cases of IBDI has also decreased [29 30]. However, several contemporary reports have suggested no change in the incidence of bile duct injuries over time6 and the number and complexity of cases referred for repair has remained static at some specialist units [31]. However, bile duct injuries by inexperience surgeon continue to appear [32].

The basic principle in the treatment of biliary stricture is to relieve the symptoms and prevent the development of secondary biliary cirrhosis. Surgery has been the standard treatment and the gold standard against which other treatments are compared. Any treatment modality should be durable and long lasting with less morbidity and no mortality. Surgery always carries morbidity and the remote possibility of mortality. The results of the surgery are variable. In the hands of experienced biliary surgeons' results have been excellent. Long-term success rate of 80-90% has been reported from high volume centers [33, 34, 35]. Biliary sepsis and portal hypertension are two factors hindering surgical success. The recurrence of stricture is reported in 10% of the patients. Treatment of choice for recurrent strictures after surgery is balloon dilatation. Some cases of recurrent stricture may warrant redo Hepaticohejunostomy.

Conclusion

The data generated from the present study concludes that Bile duct injury is more common following laparoscopic cholecystectomy. Laparoscopic cholecystectomy is a procedure of choice in uncomplicated cases with minimum complications and early recovery, shorter hospital stay and early mobilization.

References

1. El Nakeeb A, Mahdy Y, Salem A, El Sorogy M, El Rafea AA, El Dosoky M, *et al*. Open Cholecystectomy Has a Place in the Laparoscopic Era: a Retrospective Cohort Study. Indian J Surg. 2017; 79 (5):437-443.

2. Campbell BM, Lambrianides AL, Dulhunty JM. Open cholecystectomy: Exposure and confidence of surgical trainees and new fellows. Int J Surg. 2018; 51:218-222.
3. Fong Y, Jarnagin W, Blumgart LH. Gallbladder cancer: comparison of patients presenting initially for definitive operation with those presenting after prior noncurative intervention. Ann Surg. 2000; 232(4):557-69.
4. Wullstein C, Woeste G, Barkhausen S, Gross E, Hopt UT. Do complications related to laparoscopic cholecystectomy influence the prognosis of gallbladder cancer?. Surg Endosc. 2002; 16(5):828-32.
5. Varshney S, Butturini G, Gupta R. Incidental carcinoma of the gallbladder. Eur J Surg Oncol. 2002; 28(1):4-10.
6. Sedaghat N, Cao AM, Eslick GD, Cox MR. Laparoscopic versus open cholecystectomy in pregnancy: a systematic review and meta-analysis. Surg Endosc. 2017; 31(2):673-679.
7. McAneny D. Open cholecystectomy. Surg Clin North Am. 2008; 88(6):1273-94, ix.
8. Ibrahim S, Hean TK, Ho LS, Ravintharan T, Chye TN, Chee CH, *et al*. Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. World J Surg. 2006; 30(9):1698-704.
9. Licciardello A, Arena M, Nicosia A, Di Stefano B, Calì G, Arena G, *et al*. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy. Eur Rev Med Pharmacol Sci. 2014; 18(2 Suppl):60-8. [Medline].
10. Sutcliffe RP, Hollyman M, Hodson J, Bonney G, Vohra RS, Griffiths EA, *et al*. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective U.K. database of 8820 patients. HPB (Oxford). 2016; 18(11):922-928.
11. Doherty GM. "Biliary Tract". In Doherty GM (ed.). CURRENT Diagnosis & Treatment: Surgery (14 ed.). New York, NY: McGraw-Hill Education, 2015.
12. Kimura Y, Takada T, Kawarada Y, Nimura Y, Hirata K, Sekimoto M, *et al*. "Definitions, pathophysiology, and epidemiology of acute cholangitis and cholecystitis: Tokyo Guidelines". Journal of Hepato-Biliary-Pancreatic Surgery. 2007; 14(1):15-26. doi:10.1007/s00534-006-1152-y. PMC 2784509. PMID 17252293.
13. "Treatment of Gallstones and Gallbladder Disease". Society for Surgery of the Alimentary Tract. Retrieved 2018-03-27.
14. "Intraoperative cholangiography in cholecystectomy". www.sbu.se. Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU). 2018-08-17. Retrieved 2019-09-02.
15. Rabago LR, Vicente C, Soler F, Delgado M, Moral I, Guerra I, *et al*. Two-stage treatment with preoperative endoscopic retrograde cholangiopancreatography (ERCP) compared with single-stage treatment with intraoperative ERCP for patients with symptomatic cholelithiasis with possible choledocholithiasis. Endoscopy. 2006; 38(8):779-86.
16. Deslandres E, Gagner M, Pomp A, Rheault M, Leduc R, Clermont R, *et al*. Intraoperative endoscopic sphincterotomy for common bile duct stones during laparoscopic cholecystectomy. Gastrointest Endosc. 1993; 39(1):54-8.
17. Swahn F, Nilsson M, Arnelo U, Lohr M, Persson G, Enochsson L, *et al*. Rendezvous cannulation technique reduces post-ERCP pancreatitis: a prospective nationwide study of 12,718 ERCP procedures. Am J Gastroenterol. 2013; 108(4):552-9.
18. Lirici MM, Tierno SM, Ponzano C. "Single-incision laparoscopic cholecystectomy: does it work? A systematic review". Surgical Endoscopy. 2016; 30(10):4389-99. doi:10.1007/s00464-016-4757-5. PMID 26895901.
19. Jaunoo SS, Mohandas S, Almond LM. "Postcholecystectomy syndrome (PCS)". International Journal of Surgery. 2010; 8(1):15-7. doi: 10.1016/j.ijsu.2009.10.008. PMID 19857610.
20. Slantez PJ, Boland GW, Mueller PR. Imaging and interventional radiology in laparoscopic injuries to the gall bladder and biliary system. Radiology. 1996; 201:595-603.
21. Richardson MC, Bell G, Fullarton MG. Incidence and nature of bile duct injuries following laparoscopic cholecystectomy: An audit of 5913 cases. Br J Surg. 1996; 83:1356-1360.
22. Deziel DJ, Millikan KW, Economou SG, *et al*. Complications of laparoscopic cholecystectomy: a national survey of 4292 hospitals and analysis of 77604 cases. Am J Surg. 1993; 165:9-13.
23. Trams SaF. Gastrointestinal and liver disease. 7th ed.
24. Palanivelu C. Laparoscopic cholecystectomy, C. Palanivelu, Edited Textbook of surgical laparoscopy. Coimbatore, Jaypee, 2002, 121-37.
25. Udwadia TE. An operative technique for laparoscopic cholecystectomy, Suresh Deshpande Edited Comprehensive laparoscopic surgery, Kolhapur, IAGES, 2012, 61-71.
26. Rijna H, Eijsbouts QA. Assessment of biliary tract by ultrasound and cholangioghraphy during laparoscopic cholecystectomy a prospective study, Euro J. Ultrasound. May. 1999; 9(2):127-33.
27. Yeh TS, Jan YY, Tseng JH, *et al*. Value of magnetic resonance cholangiopancreatography in demonstrating major bile duct injuries following laparoscopic cholecystectomy. Br J Surg. 1999; 86:181-184.
28. Singh V, Kacker LK, Sikora SS, Saxena R, Kapoor VK, Kaushik SP, *et al*. Post-cholecystectomy external biliary fistula. Australian and New Zealand journal of surgery. 1997; 67(4):168-72.
29. Woods MS, *et al*. Characteristics of biliary tract complications during laparoscopic cholecystectomy: a multi-institutional study. Am J Surg. 1994; 167:27-34.
30. Fletcher DR, *et al*. Complications of cholecystectomy: risks of the laparoscopic approach and protective efforts of operative cholangiography. Ann Surg. 1999; 229:449-457.
31. Walsh RM, *et al*. Trends in bile duct injuries from laparoscopic cholecystectomy. J Gastrointest Surg. 1998; 2:458-462.
32. Carroll BJ, *et al*. Routine cholangiography reduces sequelae of common bile duct injuries. Surg endoscopic. 1996; 10:1194-1197.
33. Bismuth H, franco D, Corlette MB, Hepp J. Long-term result of Roux en Y hepaticojejunostomy. Surg gynaecology Obstet. 1978; 146:161-7.
34. Chapman WC, Havely A, Blumgart LH, Benjamin S. Postcholecystectomy bile duct strictures: management

and outcome in patients. Arch Surg. 1995; 130:597-604.
35. Murr MM, Gigot JF, Nagorney DM, harmsen WS, Ilstrup DM, farne MB, *et al*. Long-term result of biliary reconstruction after laparoscopic bile duct injury. Arch Surg. 1995; 134:604-10.