

## BILE DUCT INJURIES FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY- A RETROSPECTIVE STUDY AT GOVERNMENT GENERAL HOSPITAL, KAKINADA

Ravichandra Matcha<sup>1</sup>, Mythilidevi Sappa<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Surgery, Rangaraya Medical College, Kakinada, Andhra Pradesh.

<sup>2</sup>Associate Professor, Department of Surgery, Rangaraya Medical College, Kakinada, Andhra Pradesh.

### ABSTRACT

#### BACKGROUND

This study aimed at assessing the outcome of laparoscopic cholecystectomy (LC) by determining the frequency of complications, especially of bile duct injuries.

#### MATERIALS AND METHODS

The case files of all patients undergoing laparoscopic cholecystectomy between January 2008 and December 2016 at Government General Hospital, Kakinada were retrospectively analysed. We evaluated the data according to outcome measures, such as bile duct injury, morbidity, mortality and numbers of patients whose resections had to be converted from laparoscopic to open.

#### RESULTS

During the eight years (January 2008 and December 2016, 336 patients underwent LC for chronic cholecystitis (CC), of whom 22 (6.5%) developed complications. Among those who developed complications, two patients had major bile duct injuries (0.4%); 43 other patients (12.8%) had planned laparoscopic operations converted to open cholecystectomy intra-operatively. None of the patients in this study died as a result of LC.

#### CONCLUSION

Bile duct injury is a major complication of LC. Anatomical anomalies, local pathology, and poor surgical techniques are the main factors responsible. The two patients who had severe common bile duct injury in this study had major anatomical anomalies that were only recognized during surgery.

#### KEYWORDS

Laparoscopic, Open, Cholecystectomy, Common Bile Duct, Chronic Cholecystitis, Complications.

**HOW TO CITE THIS ARTICLE:** Matcha R, Sappa M. Bile duct injuries following laparoscopic cholecystectomy- a retrospective study at Government General Hospital, Kakinada. J. Evid. Based Med. Healthc. 2017; 4(91), 5470-5473. DOI: 10.18410/jebmh/2017/1093

#### BACKGROUND

Operative bile duct injury is one of the serious complications of hepatobiliary surgery. With the introduction of laparoscopic cholecystectomy (LC) there has been an increase in the incidence of such injuries<sup>1</sup>. This study was designed to know various complications that occur after LC and help surgeons in their attempts to prevent undesirable outcomes.

**Aims and Objectives-** In this study the files of 336 patients who underwent LC at Government General Hospital, Kakinada over 8 years between January 2008 and December 2016 were collected and analysed. This study aimed at assessing the outcome of laparoscopic cholecystectomy (LC)

by determining the frequency of complications, especially of bile duct injuries.

#### MATERIALS AND METHODS

The cases were evenly distributed over the eight years. The patients' ages ranged from 20 to 65 years; 84 were males and 252 were females. Operating surgeons were divided into two groups; consultants and junior and senior residents (those who worked under supervision). All patients had chronic cholecystitis (CC) and had been symptomatic for at least one year. In all patients, the presence of gall stones had been established by ultrasonography. Standard Korl-Storz instruments were used for all laparoscopic procedures. Complications were divided into major (extrahepatic common bile duct (CBD) injury which required hepatojejunostomy) and minor (wound infection, minor biliary leak, transient jaundice and ileus). In 45 of these patients a decision had been made to convert the operation intra-operatively from laparoscopic to open, for reasons that include previously undetected presence of adhesions and a difficult anatomy. In two of the 45 patients, there were major iatrogenic extrahepatic biliary duct injuries which required immediate hepatojejunostomy: One was a 25-year-old male

*Financial or Other, Competing Interest: None.  
Submission 06-11-2017, Peer Review 13-11-2017,  
Acceptance 20-11-2017, Published 22-11-2017.*

*Corresponding Author:*

*Dr. Mythili Devi Sappa,*

*#9-169/1, Sarpavaram Junction,*

*Kakinada-533005, Andhra Pradesh.*

*E-mail: mythilidevisappa64@gmail.com*

*DOI: 10.18410/jebmh/2017/1093*



patient and the other was a 30-year-old female. No long-term follow-up was available to assess late complications.

## RESULTS

Of the 336 patients, 252 (75%) were women and 84 (25%) were men. Complications occurred in 22 (6.5%) patients; two (9.1%) had major complications and 20 (88.9%) patients had minor complications, the latter included twelve minor wound infections (54.5% - all female), biliary leaks in 13.7% (three patients; one male and two females), all of whom were treated conservatively; transient jaundice in (13.7%) (Three patients, all females); and ileus in (18.2%) (Four patients)). All major complications occurred in the age-group of 20–30 years, whereas minor complications occurred mainly in the older patients (>41 years). Minor complications occurred mainly in 16 male patients (72.7%) and only 6 female patients (27.3%). Planned laparoscopic procedures were converted intra-operatively to open procedures in 45 patients (13.4%); two of whom (one male and one female) had open cholecystectomies with CBD repair. All cases of conversion and major complications and (72.7%) (n=16) of minor complications, occurred at the hands of consultants. Only (27.3%) (n=6) of minor complications occurred at the hands of junior surgeons. There were no mortalities in our study.

Carl Langenbuch performed the first open cholecystectomy in 1882. As surgeons gained more experience and open biliary operations became standardized, the incidence of bile duct injuries reduced to approximately 0.125%<sup>2</sup>. Open cholecystectomy remained the gold standard for treatment of cholelithiasis until the late 1980s when LC was introduced. It gained widespread acceptance and became the new gold standard for the management of gall stone diseases. During the surgical learning curve for this new technique there was an initial rise in the reports of bile duct injuries, resulting mainly from the surgeons' inexperience and misinterpretation of anatomy. Though the reported figures of operative bile duct injuries are much lower than the actual incidence, a recent study of 1022 LCs performed in Thailand revealed a bile duct injury rate of 0.59%, i.e., about four times the incidence reported for open cholecystectomy; this injury rate is similar to that found in our study (0.6%). In Jordan in 2001, of 791 patients with CC and 207 with acute cholecystitis (AC) who underwent LC, extrahepatic bile duct injuries were reported in only three cases.<sup>3</sup> After 1995, a median incidence rate of 0.3% was documented in data from both retrospective and prospective series.

## DISCUSSION

The single most important factor responsible for bile duct injuries is misinterpretation of the patient's anatomy. Compared to the open operation, injuries sustained during LC are more often severe (e.g., excision of a segment of the CBD) and generally extend to higher levels. The majority (70–85%) of these injuries are not recognized during the operation; however, both cases of major complications in our series were recognized during surgery and both were

iatrogenic injuries as a result of anatomical anomalies.<sup>4</sup> Bile duct injuries, substantially increase the economic burden on the patient, hospital, and community. Though the initial spike in the incidence of complications settled down as surgeons became more experienced, reports of major bile duct injuries, even in the hands of senior surgeons, continue to surface, suggesting that bile duct injuries following cholecystectomy will always remain a significant problem. However, early recognition (during operation or in the early post-operative period) improves the outcome and reduces the costs.<sup>5</sup> In our study, all major complications occurred at the hands of consultants and were recognized intra-operatively; only 20% of minor complications occurred at the hands of junior surgeons. The two cases of major complications in our study were due to anatomical anomalies of the cystic duct only. The first (a male patient), underwent a hepatojejunostomy;<sup>6,7</sup> he had a long and large-calibre cystic duct which was mistaken for the common hepatic duct (CHD). The second case (a female patient) had a spiral and very long cystic duct opening into the medial aspect of the CHD. All major extrahepatic CBD injuries in our series were recognized intra-operatively, whereas literature reports indicate that only 29% of the injuries are generally recognized intra-operatively. The injuries of the bile duct may include partial tear, laceration, transection and even excision of a portion of the duct. These injuries are seen irrespective of the type of cholecystectomy and result in biliary stricture, which is undoubtedly the most serious complication following cholecystectomy. The severity of the complication depends on the type of injury, the delay in presentation, and on whether the patient requires a revision of an initial attempt at repair. Injuries identified and repaired at the time of the first operation afford good results.

In our study, 38 patients' (84.4%) operations were converted due to anatomical difficulties encountered intra-operatively, five due to the discovery of adhesions (11.2%) and two patients' operations were converted due to common bile duct injuries (4.4%). It is clear from the literature that bile duct injuries occur even in the hands of experienced and competent surgeons but, obviously, inexperience increases the risks.<sup>8</sup> A casual attitude towards a "simple" gallbladder (resection) may result in a catastrophe. Acute inflammation around Calot's triangle makes the tissue friable and difficult to grasp.<sup>9</sup> Dissection in such conditions leads to excessive blood being present. This, together with the distorted anatomy, increases the risk of bile duct injuries during LC. On the other hand, extensive fibrosis around Calot's triangle in cases of chronically inflamed and fibrosed gallbladders may make them extremely difficult to dissect.<sup>10</sup> The cystic duct and biliary tree system may be injured if the surgeon moves from the gallbladder down into the region of the bile duct to try and separate it and in doing so causes a diathermy injury to the bile duct, which can result in a leak. Occasionally, the CBD is dissected out and divided in the belief it is a cystic duct. In such cases, partial cholecystectomy is justified, as otherwise there remains a high risk of bile duct injuries. Overzealous use of electrocautery near Calot's triangle and extensive dissection

around the CBD may damage its axial blood flow, leading to ischemic damage to the duct and late stricture formation. Excessive traction leading to tenting of the CBD is another factor predisposing to clipping and ligation of the bile duct, especially when performing an open cholecystectomy. An unnecessary attempt to demonstrate the junction of the cystic duct and the CBD can be potentially dangerous. Obesity and excessive fat in the porta hepatic area also poses technical difficulties and can predispose to bile duct injuries.<sup>11</sup>

Some authors have described the mechanism of "classic" laparoscopic injury in the presence of "normal" anatomy of the biliary tree; this pattern, occurs when the gallbladder is retracted superiorly. Surgeons believe they can see where the cystic duct is and dissect directly on to it, rather than dissecting on to the gallbladder. It is possible to follow what is believed to be the cystic duct down and then the CBD can be dissected out, clipped and then divided as the cystic duct. Dissection proceeds upwards along the medial aspect of the CBD and the CHD until damage to the right hepatic artery results. Other authors have described a variation of this sequence of events, where faulty anterior and medial traction on the Hartmann pouch fails to open up Calot's triangle causing the cystic duct and the CHD to be mistaken. The CHD common hepatic duct junction is pulled up into the cystic duct and then clipped and divided. This can result in distal obstruction of the CBD and a fistula through the open cystic duct remnant. Clearly if the surgeon is aware of the existence of a short cystic duct then particular care needs to be taken when clipping it.

Among the minor complications in our study, wound infection was the most common, followed by ileus, transient jaundice, and minor biliary leak. Minor biliary leaks were relatively unusual in our study (three of 22); two were due to the presence of an accessory duct and we were able to treat these cases conservatively; one case was due to the clips applied to the cystic duct slipping and this case had to be managed by percutaneous drainage and ERCP.

According to the literature, the leak may be minor, arising from a small, accessory bile duct and clinically insignificant. Such cases should be treated with percutaneous drainage. Injuries to the accessory bile duct are the most common cause of postoperative complications. On the other hand, a major leak due to injury to a main duct or a retained stone in the CBD may result in biliary fistula, peritonitis, or biloma.<sup>12</sup> Biliary fistula following LC is a common outcome in many studies; however, we had only one case in our series. Mostly, this complication results from improper application of clips or the clips slipping. Use of diathermy to divide the cystic duct may cause charring of the tissue and failure of the clip to hold. ERCP helps in diagnosis and removes any doubts regarding possible major ductal injuries. The condition resolves spontaneously provided there is no distal obstruction.

In bile duct excision, a portion of the bile duct is lost and simple repair, as may be done in transection and laceration, is not possible. This is the reason why both the cases with major extrahepatic biliary duct injures in this study

underwent hepatojejunostomy. The chances of late stricture are greater in bile duct transection than in bile duct laceration, as the axial vascular supply of the CBD is damaged in transection. Biliary reconstruction in the presence of peritonitis, combined vascular and bile duct injuries or injuries at or above the level of the biliary bifurcation were significant independent predictors of poor outcome. In our study, all patients had excellent recovery and were discharged in a good condition within 10 days of surgery; however, long-term follow-up was not available.

Strictures may develop early (within days or weeks) or may take years to develop and vary in both diameter and length. Early strictures may develop due to intra-operative procedures such as clamping, ligation or clipping of the duct or thermal injury. Local infection may also result in both early and delayed stricture formation. Thermal injury and occult malignancy are important causes of delayed stricture formation. A thorough knowledge of the anatomy of the region, including possible anomalies, is important in preventing iatrogenic bile duct injuries. Both open cholecystectomy and LC are based on similar operative principles. Proper exposure and visualization, careful dissection, adequate haemostasis, careful placement of ligatures and clips, and division of structures only after proper identification are essential for safe cholecystectomy. Fundus-first cholecystectomy is well recognized as a safe technique during open cholecystectomy as well as during LC, because it minimizes the risk of injuries to the biliary structures at the Calot's triangle.

## CONCLUSION

Bile duct injuries are a rare complication of both open cholecystectomy and LC. It can have devastating effects, turning the individual into a "biliary cripple". They mainly result from anatomical anomalies and errors of human judgment and are thus preventable to some extent. The costs are reduced and outcome improved if these injuries are diagnosed early (during operation or the early postoperative period). Adding the experience gained from open cholecystectomy on the one hand and the advantages of LC, in terms of visualization and magnification on the other, will help in reducing the incidence of such complications.

## REFERENCES

- [1] Huang ZQ, Huang XQ. Changing patterns of traumatic bile duct injuries: a review of forty years' experience. *World J Gastroenterology* 2002;8(1):5-12.
- [2] Mahatharadol V. Bile duct injuries during laparoscopic cholecystectomy: an audit of 1522 cases. *Hepatogastroenterology* 2004;51(55):12-14.
- [3] Sicklick JK, Camp MS, Lillemoe KD, et al. Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. *Ann Surg* 2005;241(5):786-792.
- [4] Chowanec C, Chowanec M, Kobek M, et al. Iatrogenic biliary ducts lesions after laparoscopic cholecystectomy: a medical technical error or a

- therapeutic failure in a routinely performed procedure. A medico-legal evaluation of selected cases. *Arch Med Sadovej Kryminol* 2007;57:11-18.
- [5] Bhattacharjee P. Bile duct injuries: mechanism and prevention. *Indian Surg* 2005;67:73-77.
- [6] Gharaibeh KI, Ammari F, Al-Heiss H, et al. Laparoscopic cholecystectomy for gallstones: a comparison of outcome between acute and chronic cholecystitis. *Ann Saudi Med* 2001;21(5-6):312-316.
- [7] Olsen DO. Bile duct injuries during laparoscopic cholecystectomy: a decade of experience. *J Hepatobiliary Pancreat Surg* 2000;7(1):35-39.
- [8] Mouret P. From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery the future prospective. *Dig Surg* 1991;8:124-125.
- [9] Russell JC, Walsh SJ, Mattie AS, et al. Bile duct injuries, 1989–1993. A statewide experience. Connecticut laparoscopic cholecystectomy registry. *Arch Surg* 1996;131(4):382-388.
- [10] Asbun HJ, Rossi RL, Lowell JA, et al. Bile duct injury during laparoscopic cholecystectomy: mechanism of injury, prevention, and management. *World J Surg* 1993;17(4):547-551.
- [11] Andrén-Sandberg A, Alinder G, Bengmark S. Accidental lesions of the common bile duct at cholecystectomy. Pre- and perioperative factors of importance. *Ann Surg* 1985;201(3):328-232.
- [12] Veen EJ, Bik M, Janssen-Heijnen MLG, et al. Outcome measurement in laparoscopic cholecystectomy by using a prospective complication. *Int J Qual Health Care* 2008;20(2):144-151.