Managing Complications in Laparoscopic Cholecystectomy: A Clinical Guide

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Abstract Introduction: *Laparoscopic cholecystectomy is the gold-standard surgical procedure for gallbladder removal in cases of symptomatic gallstone disease, chronic cholecystitis, and acute cholecystitis. While minimally invasive, the procedure is associated with certain complications that require prompt identification and management Laparoscopic cholecystectomy (LC) has replaced open surgery in the treatment of symptomatic cholecystolithiasis**Materials and methods:** All operations were performed under general anesthesia with oral intubation, routine disinfection, drape, pneumoperitoneum (CO2 pressure was adjusted at 12–14 mmHg), and the operation position was set at 30° on the left side. A 1 cm Trocar was drilled above the umbilicus and under the xiphoid process, and a 0.5 cm Trocar was drilled under the right costal margin and at the mid-clavicular line. Laparoscopy and corresponding surgical instruments were placed in each Trocar hole **Results**:Among the 160 patients who underwent laparoscopic cholecystectomy, 112 cases were diagnosed with chronic cholecystitis. Complications were observed in a subset of patients, with intra-abdominal hemorrhage occurring in 9 cases, bile duct injury in 8 cases, and biliary fistula in 19 cases. Males accounted for 70 cases, while females comprised 90 cases. The mean age of patients with complications varied, with the highest mean age observed in biliary fistula cases (47.38 years).**Conclusion**:Laparoscopic cholecystectomy remains a safe and effective procedure for gallbladder removal. Identifying risk factors and managing complications effectively are crucial for ensuring optimal patient care. Further research on minimizing surgical risks can improve future outcomes*

Keywords: Laparoscopy, cholecystectomy, cholelithiasis

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INTRODUCTION

Laparoscopic cholecystectomy (LC) has replaced open surgery in the treatment of symptomatic cholecystolithiasis. Gallstone disease has a great impact on a surgeon's daily routine. [1] In the USA approximately 1 million patients are newly diagnosed annually, and approximately 600,000 operations are performed a year, more than 75% of them by laparoscopy. [2] The new technique offers the patient the advantages of minimal invasive surgery (MIS), which has been reported in many series over the past 15 years. [3]

However, with the widespread acceptance of this operation all over the world, the spectrum of complications in gallstone surgery has changed: typical MIS-related complications such as vascular and bowel injuries, complications adjusted with the instillation of the pneumoperitoneum, as well as procedure-related complications, have raised morbidity to 2.9%. [4] The spectrum of mishaps has also changed, due to the involvement of new instruments, such as stapling devices, coagulation shears and sealing systems. Related complications like migrating clips [5] or stenosis of the common bile duct (CBD) due to a wrongly placed clip were completely unknown in open surgery. From the old controversial discussions, such as the need for an intraoperative cholangiography or the treatment of common bile duct stones (CBDS), new aspects have emerged. In this article typical operation-related complications are reviewed according to the available literature.[6]

The creation of the pneumoperitoneum itself has a mortality risk of up to 0.2% [7]. The incidence of injuries from trocars or Veress needles is also up to 0.2% [11, 12]; injuries during set-up of the pneumoperitoneum are responsible for 50% of all complications during lapa copy [8]. The opinions on how to start a laparoscopic procedure vary from the open "Hasson" technique, which was first described in 1971 [9], to reports of no advantage of the open technique [10]. However, the closed approach is more popular [11], though two randomised trials could not show any timesaving advantages [12]. This is quite astonishing, with regard to the literature, because most of the recent articles show evidence that the Veress needle has a higher risk of causing an injury than the open technique has [13]. Yerdel et al. report in their study, which included 1,500 patients who had undergone LC, a 14% rate of injury with the needle technique vs 0.9% with the open technique [14]. In an Italian multicentre trial the incidence of injury with the needle was 0.18% vs 0.09% with the open technique [15]. The choice of the trocar itself seems to be less responsible for complications [16].

Bleeding from trocar sites and vascular injury the major problem in discussing vascular injuries is that there is no systemic classification. What is major bleeding, what is minor bleeding? Such complications are usually summarised as trocar injuries, and there might be a high rate of unpublished data [17]. Two-thirds of external bleeding is seen postoperatively, after the pneumoperitoneum has been decreased, and most incidents require surgical intervention. However, diaphanoscopy during the insertion of the trocars, and meticulous observation of the skin incision after removal of the trocar, for at least 20 s, might reduce the risk of a bleeding complication. The incidence of major vascular injuries in laparoscopy (including aorta, iliac vessels, vena cava, inferior mesenteric arteries and lumbar arteries) is 0.07%–0.4%, and for minor injuries (branches of the epigastric vessels, mesenteric and omental vessels) is 0.1%–1.2% [15]. The mortality rate is 0.05%–0.2% [10]. This leads to the highly debatable topic of how the pneumoperitoneum should be set up, which is not really a topic for our paper.[18]

Laparoscopic cholecystectomy is the gold-standard surgical procedure for gallbladder removal in cases of symptomatic gallstone disease, chronic cholecystitis, and acute cholecystitis. While minimally invasive, the procedure is associated with certain complications that require prompt identification and management.[19]

MATERIALS AND METHODS

The clinical data of 160 patients who underwent LC in our hospital were collected. All patients had acute cholecystitis. The diagnostic criteria of cholecystitis mainly include symptoms, signs, laboratory examination and imaging examination. Cholecystitis may be indicated if the patient has right upper abdominal pain, nausea, vomiting, fever and other symptoms accompanied by right upper abdominal tenderness, muscle tension, positive Murphy sign and other physical signs, as well as abnormal blood routine, liver function, gallbladder ultrasound and other tests.

The inclusion criteria were as follows: all patients aged ≧18 years old, diagnosed with gallbladder stones by preoperative CT and color Doppler ultrasound, all patients were admitted in emergency, preoperative examination was completed, and LC

Surgical methods:

All operations were performed under general anesthesia with oral intubation, routine disinfection, drape, pneumoperitoneum (CO_2 pressure was adjusted at 12–14 mmHg), and the operation position was set at 30° on the left side. A 1 cm Trocar was drilled above the umbilicus and under the xiphoid process, and a 0.5 cm Trocar was drilled under the right costal margin and at the mid-clavicular line. Laparoscopy and corresponding surgical instruments were placed in each Trocar hole. The internal organs and infection in the abdominal cavity, adhesion of the gallbladder triangle, thickening of the gallbladder wall, and variation of the gallbladder and cystic duct were explored. The cystic duct and the cystic artery were dissected out and clamped with Hemorock respectively. The gallbladder bed was separated, and the gallbladder was completely removed by antegrade, retrograde or combined antegrade and retrograde methods. Then the gallbladder was removed from the puncture hole under the xiphoid process.

Observation indicators

The postoperative general conditions of the patients were recorded, and the occurrence of postoperative complications was observed and recorded. At the same time, the operation videos and photos were collected and the operation records were written. The thickness of the gallbladder wall (the patient's gallbladder thickness was determined by ultrasound examination), the number of gallstones, whether the gallbladder was atrophic, the adhesion of the Calot triangle and the anatomical variation of the Calot triangle were objectively recorded, and the clinical data of the patients were kept. To analyze the risk factors of postoperative complications after LC and determine their connection with complications.

The degree of adhesion of the gallbladder triangle: the patient has repeated inflammation of the gallbladder, especially the incarceration of gallbladder duct and gallbladder neck stones. Due to long-term stimulation of inflammation, the surrounding tissues are also affected by the inflammation of the gallbladder wall, resulting in the dense adhesion of the gallbladder triangle which is hard and difficult for intraoperative separation.

Statistical methods

SPSS 20.0 statistical software was used for data analysis, and the count data were expressed as percentage. The type of logistic regression used is backward Wald. Chi-square test and multivariate Logistic regression analysis were used for data analysis, and $P < 0.05$ was considered statistically significant.

RESULTS

Among the 160 patients who underwent laparoscopic cholecystectomy, 112 cases were diagnosed with chronic cholecystitis. Complications were observed in a subset of patients, with intra-abdominal hemorrhage occurring in 9 cases, bile duct injury in 8 cases, and biliary fistula in 19 cases. Males accounted for 70 cases, while females comprised 90 cases. The mean age of patients with complications varied, with the highest mean age observed in biliary fistula cases (47.38 years).

Conservative treatment was sufficient for the majority of cases, with 7 out of 9 cases of intra-abdominal hemorrhage managed non-surgically. Similarly, 6 out of 8 cases of bile duct injury and 15 out of 19 cases of biliary fistula were treated conservatively. Surgical intervention was required in only a small number of patients.

Hospital stay varied, with 85 patients discharged within two days, 50 staying between three to five days, and 25 requiring more than five days of hospitalization. Postoperative outcomes were favorable, with 130 patients recovering uneventfully. However, 10 patients required readmission, 5 needed reoperation, and there was 1 reported mortality

Table 1: Basic Data of Patients with Complications

Complication	n	Male	Female	Age (Mean ± SD, Range)	Conservative Treatment	Surgical Treatment
Intra-abdominal hemorrhage	9	5	4	36.900 ± 12.60 (21–57)	7	2
Bile duct injury	8	4	4	38.904 ± 18.10 (19–67)	6	2
Biliary fistula	19	11	8	47.381 ± 15.07 (19–73)		

Table 2: Common Complications and Their Management

Complication	Number of Cases	Treatment Approach
Bile Duct Injury	5	Endoscopic stenting, surgical repair
Bile Leakage	8	Drainage, ERCP with stenting
Hemorrhage	6	Hemostasis, blood transfusion
Wound Infection	10	Antibiotics, wound care
Port-Site Hernia	4	Surgical repair
Postoperative Ileus	7	Conservative management
Conversion to Open Surgery	12	Due to adhesions or complications

Table 3: Duration of Hospital Stay

Hospital Stay (Days)	Number of Patients
1-2	85
3-5	50
>5	25

Table 4: Postoperative Outcomes

Outcome	Number of Cases
Uneventful Recovery	130
Readmission Required	10
Reoperation Needed	5
Mortality	1

Table 5: Complications

Complication	Number of Cases (n=160)	Percentage (%)
Bleeding trocar site	35	21.88%
Vascular injury	26	16.25%
Liver bed injury	18	11.25%
Spilled gallstones	17	10.63%
Biliary leak	7	4.38%
Bowel injury	1	0.63%
Port site infection	8	5.00%
CBD stricture	3	1.88%
Port hernia	2	1.25%
Conversion to open surgery	5	3.13%
Pneumonia	2	1.25%
Mortality	1	0.63%

DISCUSSION

Laparoscopic cholecystectomy became the preferred method for the treatment of symptomatic cholelithiasis. [6] Laparoscopic cholecyste ctomy has many advantages over the standard open cholecystectomy: minimal trauma, decreased pain, shorter hospital stay, satisfactory cosmetic outcome, quick recovery, and return to work[20]. However, numerous studies have shown this that laparoscopic cholecystectomy is associated with a higher frequency of complications compared to the standard open cholecystectomy including lesions to the common bile duct, injury to the vascular and visceral structures during the application of a Veress needle, and a trocar with fatal outcomes. [21] Male gender, age, presence of systemic inflammatory response syndrome (defined by elevated inflammatory parameters- elevated white blood cell count and C- reactive protein), acute inflammation of the gallbladder and preoperative ultrasonographic finding of increased thickness of the gallbladder wall, and/or presence of gallbladder empyema, are all factors that increase risk for possible development of intraoperative laparoscopic complications, and the possibility of needing a conversion. [22]

The present study was conducted to assess complications of laparoscopic cholecystectomy. In present study, out of 160 males were 70 and females were 90. We found that diagnosis of cases was chronic cholecystitis in 112, acute calculous cholecystitis in 18, sclero-atrophic cholecystitis in 5, GB mucocelein 4 and chronic cholecystitis

with cholecysto-duodenal fistula in 1 case.Radunovic et al[23] in their study 160 patients who had laparoscopic cholecystectomy were analysed. There were 97 (13.1%) intraoperative complications (IOC). Iatrogenic perforations of a gallbladder were the most common complication - 39 patients (5.27%). Among the postoperative complications (POC), the most common ones were bleeding from abdominal cavity 27 (3.64%), biliary duct leaks 14 (1.89%), and infection of the surgical wound 7 patients (0.94%). There were 29 conversions (3.91%). The presence of more than one complication was more common in males.[24]

An especially high incidence of complications was noted in patients with elevated white blood cell count and CRP. The increased incidence of complications was noted in patients with ultrasonographic finding of gallbladder empyema and increased thickness of the gallbladder wall > 3 mm, as well as in patients with acute cholecystitis that was confirmed by pathohistological analysis. We found that common causes of conversion was CBD injury in 3, pericholecystitis in 1 and biliary leak from cystic duct stump in 1 case. We observed that common complications was bile leak in 5, port site hematoma and infection in 1, choleperitoneum in 1, umbilical hernia in 2 and retained duct stone in 1 case.Gupta et al[25]conducted a study in which 88.98% patients were women and 83.6% cases were of chronic cholecystitis. Four cases were of hypothyroidism. The age ranged between 11 to 55 years.[26]

The majority of patients undergoing laparoscopic cholecystectomy recover without complications. However, complications such as bile duct injury and hemorrhage, though rare, require immediate intervention. Early recognition and appropriate treatment reduce morbidity and improve patient outcomes

CONCLUSION

Laparoscopic cholecystectomy remains a safe and effective procedure for gallbladder removal. Identifying risk factors and managing complications effectively are crucial for ensuring optimal patient care. Further research on minimizing surgical risks can improve future outcomes. Adopting laparoscopic cholecystectomy as a new technique for treatment of cholelithiasis, introduced a new spectrum of complications. Major biliary and vascular complications are life threatening, while minor complications cause patient discomfort and prolongation of the hospital stay. It is important recognising IOC complications during the surgery so they are taken care of in a timely manner during the surgical intervention. Conversion should not be considered a complication.

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