Chapter 8

# Laparoscopic Cholecystectomy in Special Situations

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Additional information is available at the end of the chapter

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**Abstract**

Gallstone disease is one of the common diseases. Laparoscopic cholecystectomy is the routine surgical treatment. However, the optimal timing and safety to perform this operation are still debated, especially in exceptional situations of each patient. In this chapter, we have collected data from many literatures to summarize the role of laparoscopic cholecystectomy in special situations that are in patients with pregnancy, cirrhosis, diagnosis of acute cholecystitis, and situs inversus.

**Keywords:** laparoscopic cholecystectomy, acute cholecystitis, pregnant, cirrhosis, situs inversus

## 1. Introduction

Cholecystectomy is one of the most common abdominal operations. Ninety percent of patients were performed by laparoscopy. In gallstone disease, laparoscopic cholecystectomy (LC) is the gold standard for surgical treatment. Comparing with open cholecystectomy (OC), LC has many benefits that are less postoperative pain, better cosmetic, shorter hospital stays, and less disability. In 1882, Carl Langenbuch of Berlin performed the first elective cholecystectomy in a patient with symptomatic cholelithiasis. By the 1960s, laparoscopic technique has been developed. The gynecologist accomplished the first tubal ligation by laparoscopic technique. In 1987, Eric Muhe, German surgeon, performed the first LC successfully. Then, laparoscopic technique and new technology for laparoscopy have

been developed and commonly used. In 1992, there were published prospective randomized trials comparing the results of LC with OC. These results demonstrated that LC associated with less postoperative pain, shorter hospitalization, and more rapid return to full activity. At the same year, LC became the gold standard operation for gallstone disease. In 1995, Strasberg et al. reported a dissecting technique "the critical view of safety" before clipping or dividing the cystic duct. This technique resulted in decreasing the risk of bile duct injury (**Figure 1**). Three years later, Lo et al. reported early LC in patients with acute cholecystitis. These results showed fewer complications and shorter hospitalization comparing with performing interval cholecystectomy [1].

In the present, minimally invasive surgical equipment and surgical skills have more developed. Absolute and relative contraindications for LC have been diminished. Absolute contraindications include inability to tolerate general anesthesia, refractory coagulopathy, and suspicion of carcinoma. In special situations or some relative contraindications, such as in patients with liver cirrhosis, acute cholecystitis, pregnancy, and situs inversus, have been

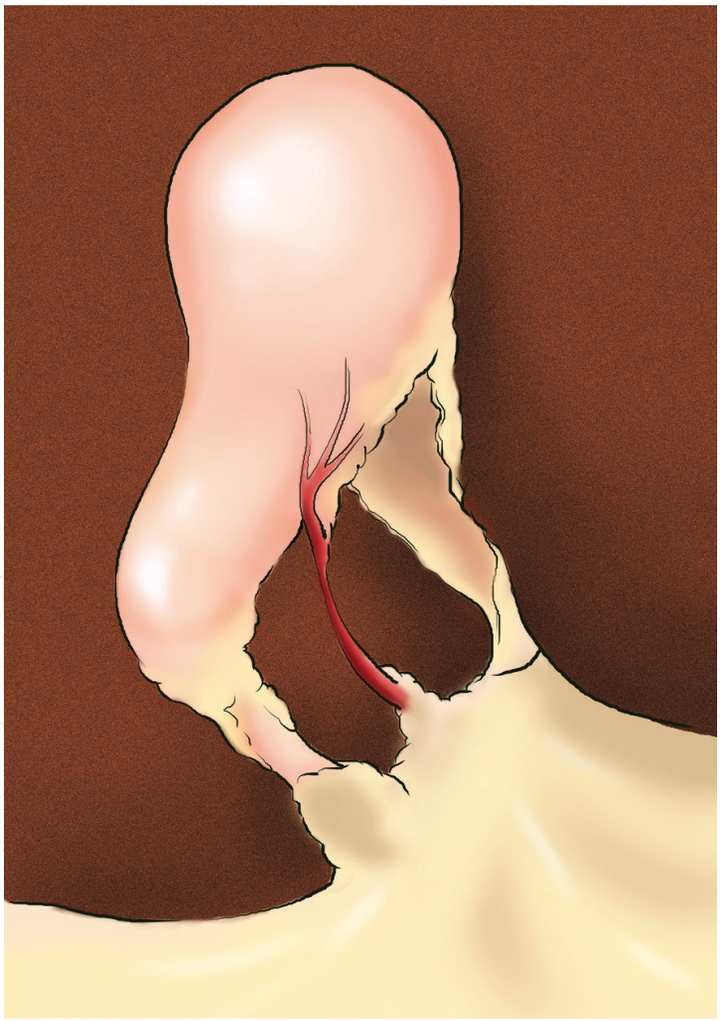

**Figure 1.** Critical view of safety for laparoscopic cholecystectomy.

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challenging. Therefore, we reviewed literatures to determine whether LC for patients with these special situations is safe.

## 2. Laparoscopic cholecystectomy in patients with acute cholecystitis

In the past, the patient with acute cholecystitis mostly scheduled for OC after the inflammation had subsided. These patients always resulted in recurrent attacks of biliary colic before definite surgery [2]. Then, many studies of early cholecystectomy within 72 hours of admission for acute cholecystitis had been published with favorable outcomes [3–7]. In 2006, Stevens et al. reported immediate LC within 24 hours of emergency department admission. Postoperative outcomes in term of operative time, conversion rate, and complication were not different from patients who had been performed LC after 24 hours. In immediate LC group, length of hospital stay was significantly shorter than patients performed LC after 24 hours [8]. In 2010, Gurusamy et al. reported a meta-analysis of randomized controlled trials comparing early LC (within 7 days of onset of symptom) with delayed LC (at least 6 weeks after the attack of symptom) in patients with acute cholecystitis. There was no significant difference regarding the incidence of bile duct injury or conversion rate between the two groups; however, patients with failed initial conservative treatment who required emergency LC had a high conversion rate of 45%. Considering the early LC group, these patients obtained a faster return to work, and the total hospital stay was shorter than in the delayed group [9]. In 2015, Wu et al. reported a meta-analysis of 15 randomized clinical trials comparing early (within 7 days of onset of symptom) with delayed LC (at least 1 week after initial conservative treatment) in a total of 1625 patients with acute cholecystitis. They found that early LC could significantly reduce hospital costs and contribute to an earlier return to work, whereas there was no significant difference in conversion rate, bile duct injury, or overall complications between two groups. In the delayed LC, patients experienced recurrent attack of gastrointestinal symptoms frequently. The incidence of recurrent attacks was 14% at 6 weeks, 19% at 12 weeks, and 29% at 1 year [10]. In 2016, Roulin et al. published a prospective randomized trial comparing clinical outcomes of early LC (as soon as possible) and delayed LC (at least 6 weeks after initial diagnosis) in 86 patients of acute cholecystitis with more than 72 hours of symptoms. The median interval of waiting time for delayed surgery was approximately 8 weeks. Thirteen patients (29.5%) of delayed LC group had recurrent of symptoms or failure of initial conservative treatment. They found that postoperative complications and overall morbidity were not significantly different between both groups. Early LC was associated with shorter total hospital stay and reduced hospital costs comparing with the delayed group [11].

In conclusion, overall morbidity and complication between early LC and delayed LC were not significantly different from previous studies. The patient with acute cholecystitis has trended to be managed by early LC within 7 days of the onset of symptom. Additionally, the patient has benefits of shorter hospital stay and reduced hospital costs comparing with the delayed LC group.

## 3. Laparoscopic cholecystectomy in pregnant patients

Gallstone-related disease, which is a wide spectrum of clinical presentations ranging from biliary colic to acute gallstone pancreatitis, is one of the most common nonobstetric conditions requiring operative management [12, 13]. The management in these patients with gallstone-related diseases still have controversy both surgeons and obstetricians. In the past, conservative treatment followed by LC was accepted to perform for pregnant patients; however, the risk of fetal death was higher [14]. Moreover, 40–92% of patients had readmission because of recurrence of symptoms [14–16]. Then, early LC is preferred, as results of maternal and fetal morbidity and mortality including the risk of preterm labor do not increase comparing with delayed LC after conservative treatment [17, 18].

From previous data, 40% of pregnant patients with symptomatic cholelithiasis require cholecystectomy [19]. Traditionally, operative treatment had been used in complicated disease, such as acute cholecystitis, common bile duct stone, repeated attacks of biliary colic, and biliary pancreatitis. Nowadays, recent evidence has found that operative management in uncomplicated disease reduced overall morbidity including maternal and fetal complications [20].

Which operation is proper for pregnant patients with gallstone-related disease, LC versus OC, has been debated. The benefit of LC in pregnant patients similar with nonpregnant patients including reduced morbidity and postoperative narcotic requirement, shorter hospital stay, and earlier mobilization [21–23]. Although LC has been accepted for pregnant patients, number of OC has still a high proportion [22, 24]. Many confounding factors include technical limitation; especially in the third trimester that large uterine resulted in poor vision obtained and limited laparoscopic access, nontechnical limitation that is uncertain physiological effect of a pneumoperitoneum on the fetus has to be investigated [23]. Nonetheless, LC seems to be performed as a favorable operation more than OC for pregnant patients. In 2011, there was literature review of performing LC comparing with OC in pregnant patients. The result showed no significant difference in postoperative complications [17]. In 2016, Sedaghat et al. reported a systematic review and meta-analysis comparing LC with OC in pregnant patients. They found that LC was a safe procedure in any trimester of pregnancy with significantly lower maternal and fetal complications, lower surgical complication, and shorter length of hospital stay comparing with OC. However, surgery should have been delayed until the second trimesters that had a lower risk of preterm delivery and also the benefit of performing the operation in an abdomen without interference of large gravid uterus. Operative time was not significant difference between the two procedures. For the risk of preterm delivery, the result showed the nonsignificant higher rate of preterm delivery in LC group compared with OC group ($P = 0.59$) [18]. In the long-term effect of the child development, there was a small series demonstrating on the growth or developmental delayed after 8-year follow-up [25].

In conclusions, LC is recommended to perform in the second trimester, which is thought to be the safest of all trimesters, because of decreased risk of abortion, reduced anesthetic risk, and avoiding the operation with large uterus in the third trimester.

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## 4. Laparoscopic cholecystectomy in cirrhotics

Cholelithiasis in patients with cirrhosis appears the incidence of 9.5–13.7% versus 5.2% in noncirrhotic patients [26, 27]. This high incidence results from several factors of cirrhotic liver, such as hemolysis, hypersplenism, reduction in biliary acidity, functional alterations in gallbladder, and metabolic liver failure, leading to an increased in unconjugated bilirubin secretion [27]. In the past, these patients mostly required cholecystectomy by an open approach. OC in cirrhotic patients related with more blood loss, longer operative time, and prolonged hospital stay, compared with those performed LC [28, 29]. Moreover, the morbidity and mortality rates for OC in cirrhotic patients were quite high with 5–23% and 7–20%, respectively [28, 29]. Excessive blood loss with following postoperative liver failure and sepsis produced such poor results [29].

The major operating difficulties contain the increased vasculature, coagulopathy, and thrombocytopenia secondary to portal hypertension that increases the risk of intraoperative bleeding [29]. In addition, the fibrotic liver may impact capability to retract the fundus of the gallbladder, which results in more troublesome exposure of Calot's triangle [30]. Thus, cirrhosis was initially considered as a relative contraindication for LC [31, 32]. Until now, there are abundant evidences to demonstrate that LC has been improved in operating skill and equipment to be safe for cirrhotic patients with symptomatic gallbladder disease. In 2012, Machado reviewed 1310 cirrhotic patients undergoing LC. Majority of the patients (78.8%) were in Child-Pugh class A, followed by 19.5 and 1.6% of Child-Pugh classes B and C, respectively. The results showed that the conversion rate was 4.58%, morbidity and mortality was 17 and 0.45%, respectively. In Child-Pugh class C patients who undergone LC, the reported morbidity has been as high as 75%. The frequent complications are liver failure and sepsis [33].

In 2003, Puggioni et al. reported a meta-analysis of 25 published reports with over 400 patients. They found that the conversion rate in cirrhotic patients was significantly higher than in patients without cirrhosis (7.06% versus 3.64%, $P = 0.024$), longer operative time (98.2 min versus 70 min, $P = 0.005$), and increased overall morbidity (20.86% versus 7.99%, $P \leq 0.001$). Comparing with OC, LC was associated with less operative blood loss (113 ml versus 425.2 ml, $P = 0.015$), shorter operative time (123.3 min versus 150.2 min, $P \leq 0.042$), and reduced length of hospital stay (6 days versus 12.2 days, $P \leq 0.001$) [29].

In 2012, Laurence et al. revealed a meta-analysis of three randomized clinical trials including a total of 220 cirrhotic patients (112 patients in LC group and 108 patients in OC group). They found that overall complications, infectious complications, and length of hospital stay were significantly reduced in the LC group. The incidence of postoperative hepatic insufficiency did not differ significantly between two groups; however, the LC group had trend to have a lower incidence of postoperative hepatic insufficiency [34]. In 2013, de Goede et al. published a meta-analysis of four randomized clinical trials comparing LC and OC for patients with cirrhosis and symptomatic cholecystolithiasis, which included a total of 234 patients. Ninety-seven percent of patients had Child-Pugh class A or B. Overall postoperative complications appeared significantly fewer after LC ($P = 0.03$). The most common postoperative complication in the

OC group was wound infection. There was no statistically significant difference in operating time between two groups (P = 0.58). Hospital stay was significantly shorter in the laparoscopic group (P ≤ 0.001). Number of blood transfusions required had no statistically significant difference between the two groups (P = 0.06). Time to resume a normal diet was significantly shorter in the laparoscopic group (P ≤ 0.001) [35].

In conclusion, LC in cirrhotic patients (Child-Pugh class A or B) can be safely performed with acceptable morbidity and benefits of less blood loss, reduced hospital stay, shorter time to resume a normal diet than in the OC group. From the limited previous data, LC should not be performed for cirrhotic patients who also have acute cholecystitis or with Child-Pugh class C.

## 5. Laparoscopic cholecystectomy in patients with situs inversus

Diagnosis of gallstone disease in patients with unknown history of situs inversus is challenging. Because of the unusual anatomy of the left-sided gallbladder (**Figures 2** and **3**), the clinical presentation of these patients usually involves left upper quadrant pain; however, 30% of patients were reported to manifest with epigastrium pain. Ten percent of patients complain of right upper quadrant pain, which is a classic presentation in the general population [36]. Such a symptom could be troublesome in patients with previously diagnosed situs inversus.

Laparoscopic cholecystectomy remains the standard operation for treatment of gallstone diseases, even in the patient of situs inversus. In 1991, Campos and Sipes reported the first successful laparoscopic cholecystectomy in a patient with situs inversus with symptomatic gallstone [37]. The difficulty of LC in a situs inversus patient is the operative technique. In 2008, Fernandes et al. described a three-port technique employed by a left-handed

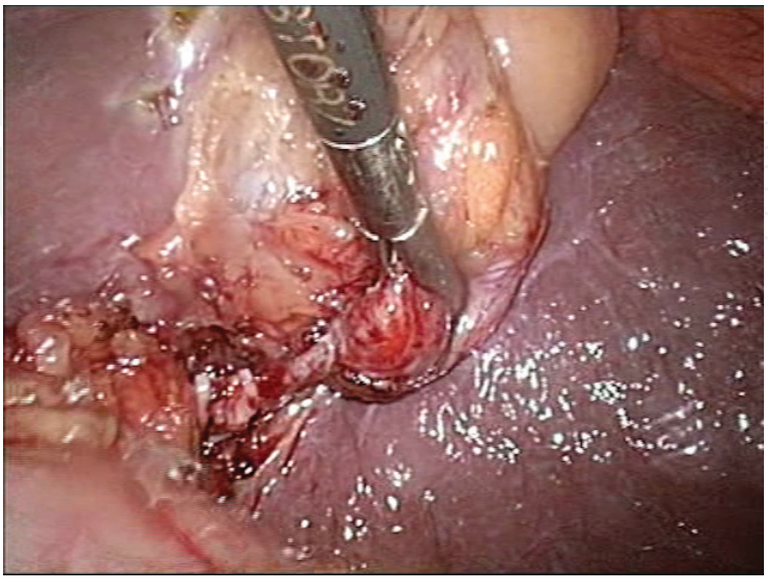

**Figure 2.** Left-sided gallbladder.

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**Figure 3.** Cystic duct identification.

surgeon. They placed a 12-mm sub-umbilical camera port, a 10-mm epigastric port, and a 5-mm left subcostal port to perform successful laparoscopic cholecystectomy [38]. In 2010, Eisenberg described a four-port technique using a "mirror image" port placement technique for ordinary laparoscopic cholecystectomy. A 12-mm camera port was inserted at umbilicus, a 5-mm port was inserted at epigastrium, and two 5-mm additional ports were placed along left subcostal line. The left-handed surgeon performed dissection through the epigastric port. However, most surgeons are right-handed dominant. They have always some troubles, such as "sword fighting" between both hands and difficulty for dissection using a nondominant hand. In 2016, Phothong et al. reported the four-port technique of LC for right-dominant surgeons. The operative equipment, surgeon's position, and port placement were prepared as "mirror image" to the routine laparoscopic cholecystectomy. The surgeon was positioned on the right side of the patient with situs inversus. They placed the left midclavicular port 5 cm caudally from left costal margin. The right-handed surgeon could perform the dissection by the dominant hand through this port with a more ergonomic position. This resulted from increased working space around Calot's triangle and decreased "sword fighting" situation [39].

Laparoscopic cholecystectomy in patients with a left-sided gallbladder is not often confidently performed by right-dominant surgeons; however, the obvious identification of Calot's triangle with or without the aid of radiologic procedure, along with the more ergonomic port position, is the key to successfully achieve this operation. Moreover, patients will still obtain benefits from this standard minimally invasive technique.

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