Elective Cholecystectomy

Arnel Abatayo

Introduction

Cholecystectomy is one of the most commonly performed abdominal surgery to date. In the last few decades, it is increasingly performed laparoscopically, even with third-world countries in Asia. In Mongolia for example, where there are limited resources, they have found a 62% increase in laparoscopic cholecystectomy being performed for 9 years since 2005 [1]. At present, the "gold standard" in gallbladder (GB) surgery is laparoscopic cholecystectomy (LC). This is because of its associated advantages over conventional open technique that includes less postoperative pain, better cosmesis, and shorter hospital stays [2–8]. However, despite the advances in technology, the complications associated with laparoscopic cholecystectomy remain the same. It is therefore necessary for surgeons to be familiar with the basic principles and techniques in performing a safe and efficient procedure. Below is the anatomy of Gallbladder (Fig. 1).

A. Abatayo (✉)
Department of Surgery, Chong Hua Hospital
Mandaue, Cebu, Philippines

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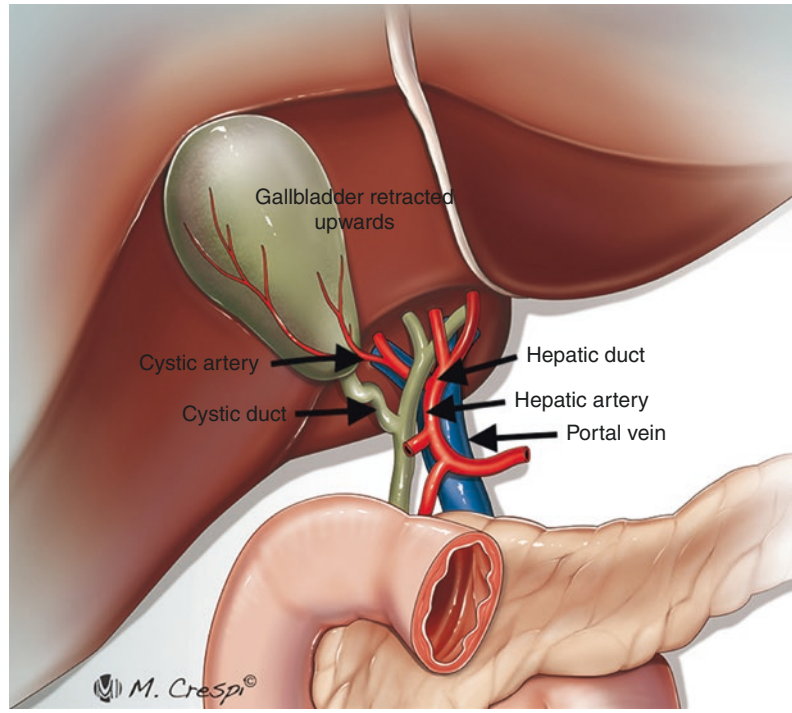

Fig. 1 Gallbladder anatomy

Indications

The indications for laparoscopic cholecystectomy are the same as for open cholecystectomy [9]:

- Symptomatic GB stones.
- Asymptomatic GB stones in patients with certain conditions (elderly patients with diabetes, patients with increased risk for GB cancer, and individuals isolated from medical care for extended periods of time).
- Acalculous cholecystitis.
- Gallbladder polyps >0.8 cm or lesser in symptomatic patients.
- Porcelain gallbladder.

Contraindications

The contraindications of laparoscopic cholecystectomy include the following:

- Generalized peritonitis.
- Septic shock from cholangitis.
- Severe acute pancreatitis.
- Untreated coagulopathy.
- Cholecystoenteric fistulas.
- Previous abdominal operations.
- End-stage cirrhosis of the liver with portal hypertension.
- Suspected or known gallbladder cancer.

However, some would consider these as relative contraindications nowadays because of surgeon experience and judgment. Absolute contraindications of LC are usually related to the anesthetic risks.

Preoperative Assessment

Laboratory Work-Up

The basic blood work-up needed in evaluating GB disease generally includes complete blood count and liver enzymes such as SGPT, Alkaline Phosphatase, and Bilirubin levels. Uncomplicated GB disease generally shows normal or unremarkable results. However, if any of these blood tests are elevated, a more compli-

cated disease should be considered, such as acute cholecystitis, or in cases where bile duct obstruction (e.g., Mirizzi syndrome, CBD stone) may be present. A study using multivariate analysis showed that neutrophil count was the only independent predictor of acute cholecystitis [10]. Also, the role of procalcitonin in determining disease severity has been discussed in some literature especially with regards to inflammatory response; however, its value in determining GB disease severity still needs further investigation. Aside from assessing for GB disease severity, it is important to evaluate for the presence of other related conditions. Serum amylase and lipase may be requested to rule out the presence of pancreatitis, especially in a patient complaining of severe epigastric pain.

Imaging

Ultrasonography

Despite the newer and more advanced imaging modality now available, ultrasonography (US) remains the first-line imaging modality in the evaluation of gallbladder disease. It is cost-effective, less invasive, widely available, and easy to use [11]. A comparison among different diagnostic imaging for acute cholecystitis reported that US has 81% sensitivity (95% CI: 0.75–0.87) and 83% specificity (95% CI: 0.74–0.89) [12].

MRI/MRCP

Magnetic Resonance Imaging (MRI) generally gives a better picture of the GB compared to US. It is the recommended imaging modality next to US, especially in cases where US report is inconclusive. The diagnostic yield of MRI for acute cholecystitis showed an 85% sensitivity (95% CI: 0.66–0.95) and 81% specificity (95% CI: 0.69–0.90) based on a 2012 meta-analysis [12]. One advantage of MRCP is that it can define the anatomy of the biliary system, which makes it very useful in assessing other related conditions.

CT Scan

Contrast-enhanced computed tomography (CT) may have a limited role in gallbladder disease. It is generally used to evaluate other organ systems to rule out other conditions. However, CT is the imaging of choice in determining an emphysematous GB. It can accurately assess the presence of gas within the gallbladder wall or lumen, indicative of GB emphysema, which appears clearly as a hypodense area on CT [13].

When to Do Surgery?

The timing of surgery depends on the overall condition of the patient. Generally, patients who are well with no signs of complicated GB disease can be scheduled electively. Otherwise, for those with more complicated GB disease, such as acute cholecystitis, an emergent or urgent surgery within 72 h is advised which is discussed in the section of emergency laparoscopic surgery.

Operating theater Setup

Below are the operating room setup (Fig. 2) and port placement (Fig. 3).

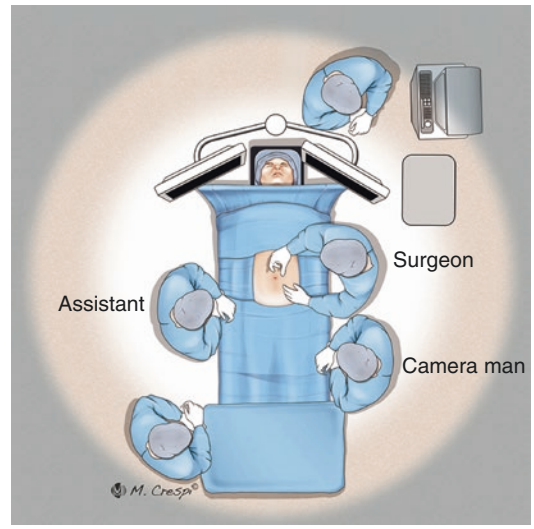

Fig. 2 Operating room setup

Port Placement

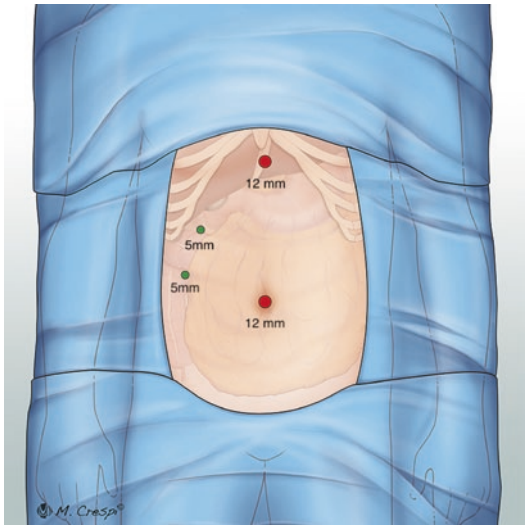

Fig. 3 Port placement

Standard Technique

1. Retract the GB fundus supero-laterally, exposing the infundibulo-cystic junction (IC) and hepatocystic triangle.
2. Open the peritoneal membrane around the IC junction, anteriorly and posteriorly, extending towards the GB body. This will open the Hepatocystic triangle.
3. Continue dissecting and clear the hepatocystic triangle to expose the cystic artery, cystic duct, and cystic plate. By doing this, you have already achieved the "critical view of safety" (Fig. 4).
4. Ligate the cystic artery using clips/suture and cut. This step sometimes helps lengthen the cystic duct, especially in cases where the IC junction is close to the CBD.
5. Intraoperative assessment of the biliary tree using intraoperative cholangiogram may be

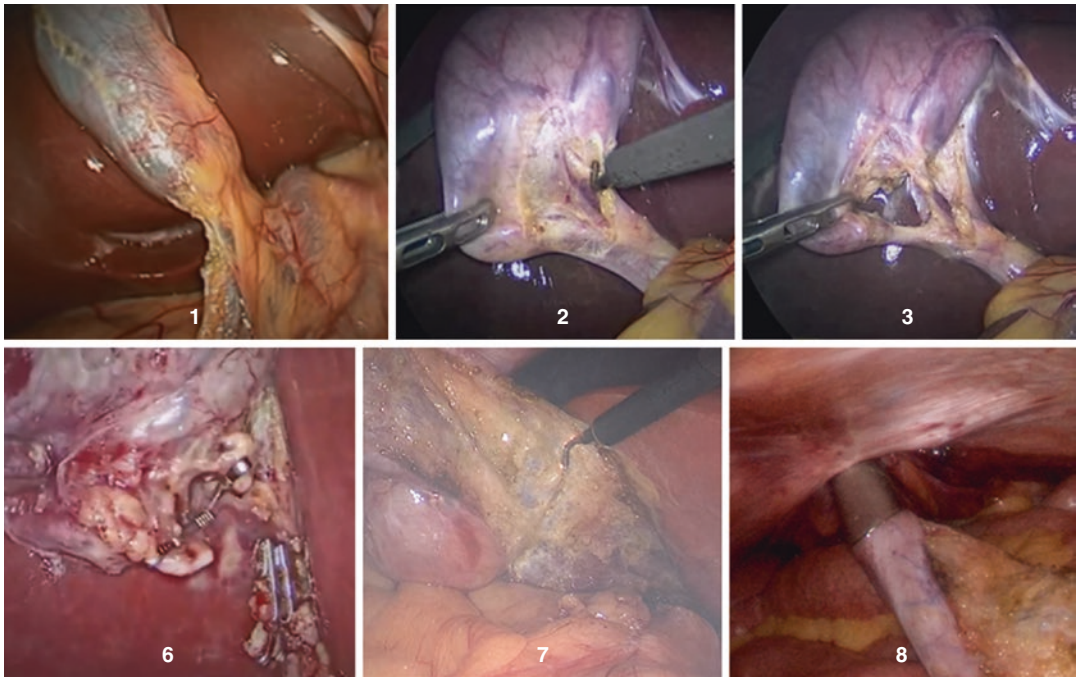

Fig. 4 Steps in doing laparoscopic cholecystectomy

selectively done depending on surgeon preference or when clinically indicated during this time.
6. Ligate the cystic duct using clips/suture and cut.
7. Completely remove the remaining part of the GB from the liver bed.
8. Extract the GB through the umbilical port. Another option is to extract the GB through the epigastric region if a larger port was used.

Complications and Management

Laparoscopic cholecystectomy is generally a safe procedure, especially in uncomplicated cases. However, in rare situations, complications occur due to several factors such as unusual anatomy, presence of inflammation and adhesions, and many others. Intraoperative complications include vascular injuries, bowel perforation, mesenteric injuries, and bile duct injuries which are usually managed successfully through laparoscopy. Although other serious complications have been reported, they will not be discussed here since they are beyond the scope of this section.

Postoperative Care

Majority of patients can start general liquids once fully awake and their diet progressed as tolerated. A low-fat diet in the early postoperative period is advised but may vary widely depending on the surgeon's experience. Some evidence demonstrated that some post-cholecystectomy patients experience food intolerance to fatty food [14, 15]. Pain in the umbilical incision can easily be managed with oral analgesics and generally resolves after 2–3 days. There are patients who may experience pain in the right shoulder which is due to the irritation of CO2 to the diaphragm, but this usually improves within 24h post-op. Patients may freely ambulate with no restrictions. In certain situations however the limitation of lifting heavy objects may be prudent for a few weeks in cases where the umbilical incision is enlarged during specimen extraction.

Laparoscopic Cholecystectomy in Obesity

Obesity used to be considered a relative contraindication to LC due to the technical difficulties associated with this condition. This resulted in a higher morbidity and mortality as well as higher rate of conversion [16]. However, due to advances in technology, improved instrumentation and increase in surgical experience, the practice of LC has become safer and more feasible among obese patients [17–19]. Majority of the issues encountered in an obese patient are due the increase in abdominal wall thickness as well as increase in intra-abdominal fat resulting in a cramped operative field. Here are a few tips that can help you achieve a safe and successful LC in this group of patients.

1. Use of longer trocars, laparoscope, and instruments.
2. When inserting trocars, it is important to angulate its direction towards the area of the gallbladder. This is because obese patients naturally have thicker abdominal wall restricting its movement.
3. In situations where long laparoscope and instruments are not available. Umbilical trocar can be inserted at the supraumbilical region to keep it close to the operative site.
4. Judicious use of additional trocars to facilitate retraction of the liver and the omentum. This can improve the operative field and provide better access to the GB and other critical structures.

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