Review Article

Acute cholecystitis at ER—We can remove it!

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A B S T R A C T

The optimal management of patients suffering from acute cholecystitis presenting in the emergency room is cholecystectomy, preferably laparoscopic. However, the operation mandates a general anesthesia, and some patients are considered to be at high risk for the procedure. However, cholecystectomy is not without complications, among which inadvertent bile duct injury is the most serious, because it can be a cause of mortality. Alternatively, the patient can be managed conservatively with or without drainage procedures, either interventional radiologic or endoscopic, and cholecystectomy can be delayed after the risk factors are corrected or acute inflammation has subsided. The best timing and sequence of treatment remain to be determined and will be discussed briefly, mainly from a surgical point of view.

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Introduction

Acute cholecystitis is one of the most common gastrointestinal diseases encountered in emergency settings.1,2 Traditionally, the patient would undergo cholecystectomy whenever he or she is ready. Recently, however, as options other than open cholecystectomy (OC)—such as laparoscopic cholecystectomy (LC), endoscopic management, and interventional procedures—are being developed, many issues of contention have emerged as to when and how to manage these patients to improve their end results.3 In this article, the debated issues will be discussed briefly and the suggested management scheme will be presented, mostly from the surgical point of view. The clinical features, etiologic agents, and diagnosis of acute cholecystitis are beyond the scope of this review, and thus, will not be mentioned in detail.3

Basic assumptions

Prior to any further discussion, a few basic considerations are worth clarifying: (1) a cholecystectomy, whether laparoscopic or open, requires general anesthesia; (2) cholecystectomy can always be done, provided that general anesthesia is possible; (3) acute cholecystitis can be lethal, if left untreated; and (4) as such, the best scenario is uncomplicated cholecystectomy, preferably laparoscopic.

Although a few studies have reported that cholecystectomy can be performed under local or regional anesthesia, the operative procedure is of great discomfort to both the patient and the operating surgeon, mainly because of visceral and parietal pain of the peritoneal cavity and inadequacy of muscle relaxation. For this reason, this procedure is usually not recommended. If the patient is critically ill, surgery under general anesthesia is considered risky; thus, emergency drainage procedures, such as percutaneous transhepatic gallbladder drainage (PTGBD) and cholecystostomy can serve as rational alternatives.6–9 However, if the patient can tolerate general anesthesia, cholecystectomy can always be performed, the details of which can be determined on a case-to-case basis. Although the natural course of acute cholecystitis is unknown because few patients are left untreated, there is enough evidence that acute cholecystitis can cause serious consequences such as intraperitoneal abscess, local and general peritonitis, sepsis, and eventual death, and the risk of complications accompanying the drainage procedure or emergency operation is accepted.6,10 Accepting these basic assumptions as facts, some of the ongoing debates will be presented in the following sections.

OC versus LC

Surgery is a relatively slow-evolving field among the medical sciences, and many of the surgical principles have been virtually unchanged for decades. Recently, however, several dramatic changes have occurred in the method of surgical approach, namely, minimally invasive surgery, including laparoscopic surgery. Since the introduction of LC in the 1980s, the procedure has become the “gold standard” in the management of gallbladder (GB) diseases including symptomatic gallstone.11 In spite of its obvious advantages over OC, however, LC is not without drawbacks, and there have been many studies weighing the pros and cons of this issue.
The most dreaded complication of cholecystectomy is inadvertent bile duct injury (BDI). During cholecystectomy, the dissection of Calot’s triangle—defined by the cystic duct, the common hepatic duct, and the cystic artery (Fig. 1)—is a critical step in which most bile duct injuries occur by misidentification of the structures or traction of the common bile duct (Fig. 2). A BDI can occur in OC as well, but LC has a higher incidence of BDI than OC, because in laparoscopic surgery, the vision is two-dimensional and tactile sense is limited by nature. The reported general incidence of BDI of LC is in the range of about 0.0% to 1.2%, whereas that of OC is about 0.0% to 0.6%, without consideration of the severity of inflammation. At the beginning of the laparoscopic era, an acutely inflamed GB was considered a relative contraindication for LC. Today, the complication rate of LC is comparable to that of OC in most centers, and the initial laparoscopic trial is justified even in patients with acute cholecystitis. However, considering that BDI is a potentially lethal complication, especially when accompanied by a concomitant vascular injury, the surgeon should not hesitate to convert to an open procedure whenever there is doubt regarding the anatomic delineation around Calot’s triangle.

### Early versus delayed operation

Again, this debate originated from the thought of how to minimize the complications accompanying cholecystectomy, especially LC. The timing of cholecystectomy can generally be classified into two options. In early cholecystectomy, the patient undergoes operation upon admission (within 72 – 96 hours after the diagnosis) or immediately after the period required for conditioning, that is, after the reversal of correctable risk factors for the operation, during the index admission. In delayed or interval cholecystectomy, the patient is managed initially with conservative measures, with or without drainage procedures, and is discharged from the hospital to be readmitted later for cholecystectomy after 2 – 3 months. The underlying rationale that favors early operation is that the surgical plane of cholecystectomy can be delineated within 72 hours of the onset of symptoms, whereas the option that favors delayed operation contends that a course of conservative management may be able control the inflammation around the GB and can help reduce the complication rate and laparoscopic completion of cholecystectomy. So far, there is no evidence supporting that this is the case, and cholecystectomy is recommended not to be delayed solely on the basis of reducing morbidity and mortality in patients with acute cholecystitis.

### Partial versus completion cholecystectomy

These modifications of operative procedures of cholecystectomy have evolved to avoid injury to the bile ducts or hepatic arteries during cholecystectomy. The usual dissecting plane is the areolar connective tissue layer intervening between the muscular layer of the GB and the liver parenchyma (Fig. 3A). In acute cholecystitis, inflammatory cells and tissue edema obliterate this plane, thus obscuring the underlying structures. Accordingly, the chance of vasculobiliary injury increases, and the dissecting plane tends to deviate, leading to GB perforation or liver parenchymal damage, in addition to the increased risk of BDI. Some strategies have been developed to bypass this natural plane, but none has been determined to offer the perfect solution. One of them is to dissect the GB from the fundus (fundus-down or antegrade technique; Fig. 2). Conventionally, when performing cholecystectomy, most surgeons begin the dissection from Calot’s triangle to control the cystic artery prior to entering the anatomical plane so as to minimize intraoperative bleeding. However, in the fundus-down technique, the GB is freed from the liver bed prior to dividing the cystic artery and cystic duct. The proposed advantage of this technique is that it can lower the chance of BDI, because the cystic duct should be the first duct encountered during dissection. Although this concept is theoretically charming, the results reported so far have not supported this belief, and the BDI rate of this technique has shown to be similar to that of the conventional retrograde technique. Another alternative is not to dissect the GB fossa at all, and leave out the liver side of the GB wall in situ (partial cholecystectomy). This method has failed to show improved results, and carries in itself the risk of missing an occult malignancy in the remaining GB mucosa. There is still another option—"completion cholecystectomy." Originally introduced by some authors for patients with GB cancer, this technique can also be applied for acute cholecystitis. In completion cholecystectomy, the GB fossa is also not dissected, but unlike partial cholecystectomy, the GB is removed from the liver parenchyma en bloc, with the whole layer of the GB adventitia (Fig. 3B). Intraoperative blood loss is somewhat greater, but rarely to the extent of requiring a transfusion. The
The author prefers this technique, and believes that in many cases of acute cholecystitis, open conversion had been salvaged using this method. In summary, there is no single guaranteed method for removal of the GB in acute cholecystitis; thus, the operator should decide the most appropriate approach to use on a case-by-case basis. It is recommended that the surgeon be familiar with each of these techniques, so as to apply the most appropriate procedure whenever required.

Fig. 3. Operative view of the dissecting plane. (A) Dissection through the conventional areolar tissue of the GB bed. (B) “Completion cholecystectomy,” removing the whole layer of the GB wall. GB, gallbladder.

Fig. 4. A 62-year-old male patient with acute cholecystitis. (A) Intraoperative cholangiography showed missing right hepatic duct. Note that the image can be misinterpreted as “normal” if the medial sectoral branch (arrow) is recognized as the right hepatic duct. In the presented case, open conversion with right hepaticojejunostomy (H-Jstomy) was performed. (B) A magnetic resonance cholangiopancreatography taken 18 months later showed patent H-Jstomy (arrow).

Fig. 5. A 65-year-old female patient with chronic cholecystitis. (A) Postoperative endoscopic retrograde cholangiopancreatography after open cholecystectomy. The patient showed persistent bile leak. The right posterior sectoral branch is missing (arrow). Intraoperative cholangiography was not taken, and the injury was not detected intraoperatively. (B) A computed tomography taken 18 months later after percutaneous drainage showed a dilated right posterior sectoral duct with atrophy of the draining segment (arrow).
PTGBD from a surgeon’s point of view

PTGBD, as an emergency interventional procedure, has imposed a great impact on the surgical decision making process, and will be discussed in another session by experienced authors. From a surgical point of view, PTGBD has obviated the need for emergency operations in high-risk patients, and has helped to save time for patient conditioning for elective surgery and general anesthesia. However, once PTGBD is performed, interval cholecystectomy is mandatory, and a cost–benefit analysis should be weighed with regard to the patient’s improved prognosis.

Preoperative endoscopic retrograde cholangiopancreatography

The incidence of bile duct stones in symptomatic gallstone patients is reported to be about 10%. In acute cholecystitis, endoscopic retrograde cholangiopancreatography is indicated when there is a strong suspicion of combined common bile duct stones, such as abnormal liver function test or dilated bile ducts on imaging studies. The underlying rationale is that when the tissues surrounding the liver hilum and GB are inflamed, common duct exploration can be a challenging and time-consuming procedure, especially with laparoscopy.

On bile duct injury

As mentioned above, every effort should be made to avoid this complication, regardless of the operative method and time. Once it has occurred, a BDI is a serious morbidity factor that may affect the patient’s entire life. When a BDI is recognized, many experienced authors recommend to end the operation with profuse drainage in situ and to transfer the patient to a tertiary hospital with adequate facilities and biliary specialists, because on-site trials to repair the damage with inexperienced hands can make matters worse, compromising the patient’s prognosis and making the subsequent reparative operation even more difficult. If corrective surgery is to be performed, hepaticojejunostomy is the preferred method to carry out primary repair of the bile duct unless the damage is a partial clean-cut injury, because stricture of the bile duct or the anastomosis site may cause recurrent cholangitis, biliary cirrhosis, and even death months to years after surgery.

On intraoperative cholangiography

Whether or not to take an IOC is the operating surgeon’s decision and is dependent on the patient’s condition. Although an IOC cannot totally prevent a BDI, it can at least keep the damage to a minimum and allows for detection of injury during the index operation, which is important for successful repair. However, even after taking an IOC, caution should be paid when interpreting the image, because it can mislead to both false negative and false positive conclusions.

Personal experience

The author’s experience is presented in Fig. 6. From January 1, 2009 to December 31, 2011, 532 cholecystectomies were performed. There were 141 cases (26.5%) of acute cholecystitis, most of them admitted via the emergency room. LC was performed in 132 cases (93.6%), and the other nine cases (6.4%) were converted to OC.
more factor to consider is the availability of an experienced hepato-pancreatic surgeon. Knowing that the most favorable result is safe LC, the availability of a surgeon with expertise in LC can alter the scheme of recommendations.

In conclusion, LC is the primary modality in the management of acute cholecystitis encountered in the emergency room. However, in patients with a high risk for general anesthesia, interval cholecystectomy with or without PTGBD can be a valid option. Most importantly, a concordant team approach involving a surgeon, an internist, an anesthesiologist, an interventional radiologist, and an endoscopist is mandatory.

Conflict of interest

None to declare.

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References