

## Training vs practice: A tale of opposition in acute cholecystitis

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### Abstract

Acute cholecystitis is one of the most common surgical diagnoses encountered by general surgeons. Despite its high incidence there remains a range of treatment of approaches. Current practices in biliary surgery vary as to timing, intraoperative utilization of biliary

imaging, and management of bile duct stones despite growing evidence in the literature defining best practice. Management of patients with acute cholecystitis with early laparoscopic cholecystectomy (LC) results in better patient outcomes when compared with delayed surgical management techniques including antibiotic therapy or percutaneous cholecystostomy. Regardless of this data, many surgeons still prefer to utilize antibiotic therapy and complete an interval LC to manage acute cholecystitis. The use of intraoperative biliary imaging by cholangiogram or laparoscopic ultrasound has been demonstrated to facilitate the safe completion of cholecystectomy, minimizing the risk for inadvertent injury to surrounding structures, and lowering conversion rates, however it is rarely utilized. Choledocholithiasis used to be a diagnosis managed exclusively by surgeons but current practice favors referral to gastroenterologists for performance of preoperative endoscopic removal. Yet, there is evidence that intraoperative laparoscopic stone extraction is safe, feasible and may have added advantages. This review aims to highlight the differences between existing management of acute cholecystitis and evidence supported in the literature regarding best practice with the goal to change surgical practice to adopt these current recommendations.

**Key words:** Cholangiography; Acute cholecystitis; Ultrasound; Laparoscopy; Cholecystectomy; Evidence based

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**Core tip:** General surgeons commonly perform laparoscopic cholecystectomy for acute cholecystitis; however, current practices in biliary surgery often vary regarding timing, intraoperative biliary imaging, and management of bile duct stones. In spite of growing evidence in the literature defining best practice and societal guidelines supporting early cholecystectomy, intraoperative cholangiogram and ultrasound, and laparoscopic bile

duct exploration utilizing laparoscopic ultrasound and performing common bile duct exploration, an overwhelming number of surgeons still perform delayed operations, rarely perform intraoperative imaging and defer treatment of common bile duct stones. Efforts should be made to adopt the evidence-based data supported in the literature.

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## THE DICHOTOMY OF LAPAROSCOPIC CHOLECYSTECTOMY TIMING

The timing of cholecystectomy in the management of patients presenting with acute cholecystitis is variable and controversial in spite of well-published guidelines from surgical societies: SAGES and SSAT advocating early cholecystectomy during same hospital admission<sup>[1]</sup>. Two current approaches exist in the treatment of acute cholecystitis: (1) the traditional, conservative approach consisting of initial antibiotic therapy or percutaneous cholecystostomy followed by delayed cholecystectomy (DC) once inflammation has resolved; and (2) the preferred approach of early surgical intervention, ideally utilizing laparoscopic cholecystectomy (EC) within three to seven days of admission. Many surgeons continue to practice the former due to a number of reasons, such as a belief that an operation will be technically easier after a two to six week delay. Patient comorbidities, and the thought that laparoscopic cholecystectomy may be relatively contraindicated in acute cholecystitis for it may lead to high conversion rates have led to a resurgence of percutaneous cholecystostomy beyond the accepted indications in medically compromised patients. However, a wide range of practicing surgeons in the United States, ranging from 20% to 65% favor performing a laparoscopic cholecystectomy early during the initial presentation of acute cholecystitis<sup>[2-4]</sup>. Current surgical training has shifted this paradigm more towards early surgical intervention based on strong evidence of its benefit. However, practicing surgeons have been slow to embrace the change for a variety of reasons<sup>[3,5,6]</sup>.

The concern for increased morbidity by operating in a surgical field of acute inflammation still persists. While significantly decreased morbidity rates for patients undergoing EC (12.0%) compared to DC (33.3%) was demonstrated in the ACDC trial, these results were not replicated on a recent meta-analysis where similar morbidity rates between EC patients and DC patients (0.12% vs 0.27%) were observed<sup>[7,8]</sup>. In the elderly population, where the number of comorbidities is often higher, similar morbidity rates were shown between EC patients and DC patients<sup>[9]</sup>. However, decreased rates of

cholangitis and persistent cholecystitis (1.3% vs 10.3%) and a decreased rate of septic shock (0.0% vs 1.3%) have been demonstrated in EC patients<sup>[7]</sup>. Most studies with the highest level of evidence demonstrated similar morbidity rates between EC and DC patients while some even show improved outcomes for EC patients<sup>[4,7-9]</sup>. A recent study analyzing the management of acute cholecystitis in the elderly did not show any significant differences in outcomes between the early and late cholecystostomy groups. Furthermore, percutaneous cholecystostomy did not confer any significant benefit as a bridge to cholecystectomy except in medically compromised patients<sup>[1]</sup>.

The concern for an increased risk of bile duct injuries when operating in acute inflammation may deter some surgeons from early cholecystectomy. However, a meta-analysis, which included seven trials and over 1106 patients, demonstrated a similar common bile duct injury rate between patients undergoing an EC vs a DC (0.002% vs 0.004%)<sup>[8]</sup>. In addition to the meta-analysis, a database review by Zafar *et al*<sup>[4]</sup>, which included over 95000 patients, failed to show a difference in observed bile duct injury rates. The literature supports equal rates of bile duct injury irrespective of laparoscopic cholecystectomy timing.

Many surgeons may choose to delay laparoscopic cholecystectomy in times of acute inflammation to lessen the chance of converting to an open procedure. The current literature does not support this concern. There exists no difference in conversion to open operations in patients undergoing an EC, with rates as low as 0.14% in a large meta-analysis to ranges of 5.0%-9.9% in elsewhere in the literature<sup>[4,7,8]</sup>. These rates compare to patients undergoing DC with rates as low as 0.16% in meta-analysis and ranges of 1.7%-11.9% elsewhere in the literature<sup>[4,7,8]</sup>. Results were similar in the elderly population<sup>[9]</sup>. An increase in conversion rates after 5 d of symptoms to open cholecystectomy was shown by Zafar *et al*<sup>[4]</sup>, further supports EC.

Some surgeons may be hesitant to perform a laparoscopic cholecystectomy because such an operation may be thought to lead to longer hospital stays, higher costs and decreased patient satisfaction. Significantly shorter hospital stays in EC patients, when compared to DC patients, have been demonstrated and includes the elderly population<sup>[4,9,10]</sup>. Zafar *et al*<sup>[4]</sup> demonstrated an increased postoperative stay of two days in patients whose laparoscopic cholecystectomy was performed after 5 d. Decreased hospital stay is one factor that has led to decreased costs in EC. A cost savings of nearly 31% has been observed in the literature<sup>[7]</sup>. In addition, Johner *et al*<sup>[11]</sup> demonstrated not only a \$2028 (2009 Canadian dollar) cost savings but a gain of 0.03 quality-adjusted life year (QALY) gain in patients undergoing EC. Compared to EC, delayed cholecystectomy led to a significantly increased rate of persistent abdominal pain, 10.0% vs 2.3% in EC patients, and increased rates of persistent fever, 3.3% vs 0.3% in the EC group<sup>[7]</sup>. When mean patients satisfaction scores were determined, EC patients had significantly higher satisfaction (92.7)

compared to DC patients (75.3)<sup>[10]</sup>. This difference was attributable to persistent and recurrent biliary attacks in patients undergoing DC<sup>[10]</sup>.

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## THE DICHOTOMY OF BILIARY DUCT IMAGING IN ACUTE CHOLECYSTITIS

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Two current approaches exist regarding intraoperative evaluation of the biliary tree: One that routinely evaluates biliary ductal anatomy during a laparoscopic cholecystectomy and the alternative, a selective approach, that completes intraoperative imaging based on individual clinical factors. To date, no randomized controlled study has been appropriately powered to endorse routine biliary imaging, however many studies have demonstrated a trend towards decreased biliary ductal injuries with routine evaluation<sup>[12,13]</sup>. Despite this trend in data and despite a bile duct injury being one of the most dreaded complications of biliary surgeons, few training programs endorse a curriculum of routine imaging and few surgeons have adopted it as part of their practice.

When a surgeon undertakes biliary imaging, the next decision to be made is which method of imaging should be employed. Many techniques have been described in the literature but the two most popular are intraoperative transcystic cholangiography (IOC) and laparoscopic ultrasound (LUS). Intraoperative cholangiogram is completed by cannulating the transected cystic duct with a small lumen catheter and is the most common method utilized. Alternatively, laparoscopic ultrasound uses a flexible probe dressed in a sterile sheath to evaluate both ductal anatomy and the hepatic vasculature. In an attempt to try and demonstrate one method superior to the other, Aziz *et al.*<sup>[14]</sup> performed a meta-analysis including 11 studies whose results demonstrated no significant difference in either sensitivity or specificity between each method. However, more recent studies have been able to demonstrate a higher specificity, in some cases nearly 100%, using laparoscopic ultrasound<sup>[15]</sup>. Additional advantages to LUS include that it is efficient, does not require cannulating the biliary system, and it can be accomplished prior to a complete and sometimes tedious dissection as it is easily repeated as needed during the course of an operation. Furthermore, LUS does not require fluoroscopy, and it has a lower failure rate than IOC, being extremely useful in defining the hepaticoduodenal anatomy<sup>[15-17]</sup>. In spite of these many benefits, LUS is rarely taught and rarely utilized in practice because of the technique's large learning curve and the traditional acceptance of IOC as best care.

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## THE DICHOTOMY OF TREATING COMMON BILE DUCT STONES IN ACUTE CHOLECYSTITIS

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The rate of common bile duct stones in acute chole-

cystitis ranges from 3%-18%<sup>[18]</sup>. Many algorithms have been established to manage choledocholithiasis but controversy exists to which is the best method. When open cholecystectomy was standard of care, the majority of common bile duct stones were removed at the time of surgery by means of a common bile duct exploration *via* a choledochotomy or an indirect transcystic method. Early in the laparoscopic era, there were limited capabilities of laparoscopic instruments and surgeons' lacked the expertise to complete a common bile duct exploration. As such, endoscopic retrograde cholangiopancreatography (ERCP) became standard practice. With improved laparoscopic instruments and advanced training, laparoscopic common bile duct exploration (LCBDE) rates are on the rise. In conjunction with intraoperative biliary ductal imaging, LCBDE allows for the management of common bile duct stones during one procedure. This technique has been shown to have a statistically significant reduction in total costs, length of hospital stay from 98 h with ERCP to 55 h, and number of procedures performed<sup>[19,20]</sup>. In addition, a trend towards better ductal clearance has been demonstrated<sup>[19]</sup>. Although utilization of LCBDE is gaining popularity, use is largely limited to fellowship trained minimally invasive or hepatobiliary surgeons and has not yet been readily adopted by most general surgeons despite improved outcomes.

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## THE FUTURE OF BILIARY SURGERY

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Even though laparoscopic cholecystectomy for acute cholecystitis is one of the most commonly performed operations by general surgeons, current practices in biliary surgery remain varied despite growing evidence in the literature defining best practice. Despite improved outcomes by performing an early cholecystectomy in acute cholecystitis and current training mirror such recommendations, an overwhelming number of surgeons still perform delayed operations. Despite superior outcomes when LUS and IOC are utilized, a very limited number of residents will be proficient at these techniques upon completion of training and thus will not incorporate them into clinical practice. Due to this lack of expertise, many surgeons have come to rely on other tools including MRCP for preoperative definition of anatomy and ERCP to diagnose and remove common bile duct stones. Although these alternative methods have utility in a majority of cases, they come with additional potential morbidity and costs. Efforts should be made for surgical practice to catch up to surgical training and the evidence supported in the current literature.

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