

Open Versus Laparoscopic Cholecystectomy: Indications, Evaluation, and Patient Selection

Elhadi Yousif*, Fatimah Ahmed Almualllem, Alaa Abdullah Alturaik, Alhanof Nasser Fahad Almotairi and Abdullah Saud Alfaraaj

Alnuairyah General Hospital, Saudi Arabia

***Corresponding Author:** Elhadi Yousif, Consultant of General Surgery, Alnuairyah General Hospital, Saudi Arabia.

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Abstract

Introduction: Cholecystectomy constitutes one of the most common abdominal operation. The procedure is typically laparoscopic, especially in developed countries. In the United States, about 90 percent of cholecystectomies are performed laparoscopically.

Aim of the Work: The indications for cholecystectomy, the evaluation of patients before cholecystectomy regardless of the disease, as well as the choice of open versus laparoscopic approaches are the focus of this review.

Methodology: We have reviewed relevant articles in the medical literature using PubMed and Google Scholar search engine between 1990 and 2020.

Conclusion: Open cholecystectomy is indicated, in most cases, when laparoscopic approach cannot be performed safely or effectively. Conversion to an open approach has been reported in 9.5 percent. Predictors of conversion to open approach include age, male gender, emergency status, serum albumin, and previous abdominal surgery. Absolute indications for open cholecystectomy include inability to tolerate pneumoperitoneum, the presence of refractory coagulopathy, high suspicion of gallbladder cancer, and in patient with other abdominal indication for open approach.

Keywords: Gallstones; Cholecystitis; Cholecystectomy; Laparoscopic; Open Cholecystectomy

Introduction

The gold standard surgical treatment of gallstone disease is cholecystectomy. Cholecystectomy constitutes one of the most common abdominal operation. Nowadays, cholecystectomy is typically a laparoscopic procedure, especially in developed countries. In the United States, for example, about 90 percent of cholecystectomies are performed laparoscopically [1].

Laparoscopic approach is associated with less postoperative pain, better cosmetics, better economic benefits, shorter hospital stays, and less absence from work compared with open cholecystectomy [2]. However, it is associated with higher risk of serious complication rate than that seen in open cholecystectomy [3]. Open cholecystectomy is generally indicated when laparoscopic cholecystectomy is not possible or safe. Open cholecystectomy may also be performed incidentally (during other operation if needed) or as an integral part of another operation such as pancreaticoduodenectomy.

In this review, we will focus on the indications for cholecystectomy, the evaluation of patients before cholecystectomy regardless of the disease, as well as the choice of open versus laparoscopic approaches.

Methods

We conducted comprehensive search of medical literature databases using PubMed and google scholar search engine between 1990 and 2020. On PubMed, we used Medical Subject Heading (MeSH) method for adequate results. All articles were screened and relevant articles were included. The term used in search include gallstones, cholecystitis, laparoscopic cholecystectomy and open cholecystectomy.

Indications

Generally, conditions that commonly indicate cholecystectomy include symptomatic cholelithiasis with or without complications, prophylactic cholecystectomy in patients at increased risk for gallbladder carcinoma or gallstone complications, patients with porcelain gallbladder, and the presence of larger than 0.5 cm gallbladder polyps.

Concomitant cholecystectomy may be performed in patients with asymptomatic cholelithiasis undergoing an abdominal operation for another unrelated condition. In these patients, cholecystectomy may be considered when the patients is stable, the main operation has proceeded smoothly, and the cholecystectomy appears straightforward operation. This indication is evidenced by the higher risk of developing symptomatic gallbladder disease within several years following abdominal operation in patients with asymptomatic gallstones [4]. On the other hand, prophylactic cholecystectomy is mostly not indicated for patients with asymptomatic gallstone disease as they are at low risk of developing life-threatening, severe complications. In fact, one analysis has showed that prophylactic cholecystectomy slightly decreased survival and was not associated with significant gain in discounted life-years gained [5]. Even when symptoms do occur in these patients, they are generally mild at first. Educating these patient about the suggestive symptoms is the best approach, so they can seek treatment before more severe symptoms or complications develop.

Cholecystectomy is indicated in patient at higher risk for gallbladder, if they fit surgical intervention. Examples of patients at higher risk for gallbladder cancer include patients with anomalous pancreatic ductal drainage, gallbladder adenomas, porcelain gallbladder, and patients with particularly larger than 3 cm gallstones [6-8].

Patients with hemolytic blood disease are prone to high incidence of forming pigment gallstones [9]. Patient with sickle cell disease should undergo incidental cholecystectomy if abdominal surgery is being performed for another reason. In patients with hereditary spherocytosis, cholecystectomy is recommended if the patient has gallstones, and a splenectomy is being performed as part of the treatment.

Although patient with diabetes mellitus may be considered at higher risk for severe gangrenous cholecystitis [10], they are at similar risk of biliary colic and other gallstone complications as the general population [11]. More than 30 percent of patients with morbid obesity who have undergone gastric bypass may develop gallstones [12,13]. However, the decision of cholecystectomy in asymptomatic patient at the time of bypass remains controversial.

Evaluation

Generally, patients evaluated to undergo open cholecystectomy are older than candidates for laparoscopic cholecystectomy, with more comorbidities [14]. Hence, very detailed medical history should be obtained in these patients to minimize perioperative morbidity and mortality. Physician should discuss possible complications of cholecystectomy and explain the potential need for additional procedures.

Prior to cholecystectomy, laboratory testing should include a complete blood count, liver enzymes, amylase, and lipase. In patients undergoing cholecystectomy for uncomplicated cholecystitis, the serum total bilirubin and alkaline phosphatase concentrations are not commonly elevated, since biliary obstruction is limited to the gallbladder. Elevated total bilirubin and alkaline phosphatase level should raise concerns about complicating conditions such as cholangitis, choledocholithiasis, or Mirizzi syndrome. However, some authors reported a mild elevations in the absence of these complications. Abnormal results such as liver function tests, amylase, or lipase level should be

repeated to serve as a control for progression or resolution postoperatively. Coagulation tests are not routinely needed prior to cholecystectomy unless there is a reason to believe an abnormality may be present. Additional preoperative lab testing is not routinely ordered for young, otherwise healthy patients, with gallstones and no evidence of pericholecystic inflammation or bile duct dilation. The exception is when a new clinical event such as significant pain, fever, or jaundice, has occurred, or when the physical exam suggests abnormality.

Imaging modalities beneficial in the evaluation of candidates for cholecystectomy include Ultrasonography (US) of the right upper quadrant. US is able to establish the diagnosis of gallstones or abnormalities of the gallbladder wall and may also demonstrate common bile duct (CBD) dilatation, stones, or the presence of gallbladder acute inflammation. If the US is inconclusive, nuclear cholescintigraphy using technetium-labeled hepatic iminodiacetic acid or hepatic iminodiacetic acid [HIDA] may be used. More advanced imaging techniques include computed tomography and magnetic resonance cholangiopancreatography (MRCP) may be needed. Imaging modalities do not need to be repeated.

Endoscopic retrograde cholangiopancreatography (ERCP) is recommended prior to open cholecystectomy in patients suspected of having biliary obstruction. Suggestive of biliary obstruction include a dilated CBD, CBD stones, or jaundice. Usually, ERCP is therapeutic in patients with stone impaction and it can be used to rule out malignancy. If removing the stone was not successfully achieved with the ERCP, the surgeon should be prepared for an operative common bile duct exploration.

The decision between open versus laparoscopic cholecystectomy

Typically, cholecystectomy is a laparoscopic procedure. Open cholecystectomy is indicated, in most cases, when laparoscopic approach cannot be performed safely or effectively. Conversion to an open approach has been reported in 9.5 percent of one million laparoscopic cholecystectomies between 2000 and 2005 [15]. Other larger study has reported similar estimation [16]. Predictors of conversion to open approach include age, male gender, emergency status, serum albumin and previous abdominal surgery [16]. Unfortunately, conversion to open cholecystectomy does not ensure better outcomes in patients with severe acute cholecystitis [17]. In patient unfit for surgery, gallbladder draining with percutaneous cholecystostomy followed by delayed cholecystectomy could be the best approach to avoid catastrophic vasculobiliary injuries associated with immediate surgery [17].

Absolute indication for open cholecystectomy include inability to tolerate pneumoperitoneum due to hemodynamic instability or significant cardiorespiratory comorbidities, the presence of refractory coagulopathy, high suspicion of gallbladder cancer, and in patient with other abdominal indication for open approach. Pneumoperitoneum may cause cardiovascular collapse in a hemodynamically unstable patient or in a patient with marginal cardiopulmonary reserve. In patient with refractory coagulopathy, multiple bleeding points and generalized oozing is more easily handled in an open operation. The open approach is recommended in case of cancer suspicion to avoid perforation of the gallbladder and intraperitoneal dissemination of malignant cells [18].

Relative indications for open cholecystectomy as the initial approach include a history of previous upper abdominal surgery for the fear of fibrotic tissue that may preclude safe laparoscopic dissection. A history of a cholecysto-enteric fistula, pregnant women, patient with cirrhosis and/or portal hypertension are other relative indication to consider open surgery. Although studies report safety of laparoscopy in any trimester of pregnancy, port placement and insufflation could be difficult especially in the third trimester.

Laparoscopic cholecystectomy are contraindicated mainly due anesthetic concerns such as in case of diffuse peritonitis, hemodynamic instability, and uncontrolled bleeding disorders [19]. The inability to tolerate general anesthesia could be considered a relative contraindication as successful laparoscopic cholecystectomy under spinal anesthesia has been reported [20].

Conclusion

Laparoscopic approach is associated with less postoperative pain, better cosmetics, shorter hospital stays but higher risk of serious complication rate compared with open cholecystectomy. Typically, cholecystectomy is a laparoscopic procedure. Open cholecystectomy

is indicated, in most cases, when laparoscopic approach cannot be performed safely or effectively. Conversion to an open approach has been reported in 9.5 percent. Predictors of conversion to open approach include age, male gender, emergency status, serum albumin, and previous abdominal surgery. Absolute indication for open cholecystectomy include inability to tolerate pneumoperitoneum, the presence of refractory coagulopathy, high suspicion of gallbladder cancer, and in patient with other abdominal indication for open approach.

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