

CLINICAL STUDY

Predictive factors for conversion of laparoscopic cholecystectomy in patients with acute cholecystitis

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Abstract: *Objectives:* Laparoscopic management of acute cholecystitis may still be associated with increased risk of complications and the conversion rate to open cholecystectomy is accordingly higher when compared to elective cases. The aim of this study was to evaluate preoperative factors associated with conversion in acute cholecystitis.

Patients: The records of 108 patients who underwent early laparoscopic cholecystectomy for acute cholecystitis.

Results: Of 108 patients, 19 (17.59 %) needed conversion to open cholecystectomy. Fifteen patients who required conversion to open cholecystectomy had severe inflammation and adhesions obscuring the plane of dissection and anatomy around Calot's triangle. For the remaining four patients, conversion was also necessary because of uncontrolled bleeding. Linear regression analysis revealed that advanced age ($p=0.029$), obesity ($p=0.024$) and pericholecystic fluid at the USG ($p=0.009$) were statistically significant risk factors for conversion.

Conclusion: The identified risk factors do not contraindicate laparoscopic cholecystectomy; however surgeons should avoid laparoscopy-associated complications by performing open operations when appropriate (Tab. 3, Ref. 26). Full Text (Free, PDF) www.bmj.sk.

Key words: acute cholecystitis, laparoscopic cholecystectomy, conversion, complication, length of stay.

Since its introduction, laparoscopic cholecystectomy (LC) has become the procedure of choice for the treatment of symptomatic gallstones and chronic cholecystitis. During the initial development of LC, acute cholecystitis was considered to be a relative contraindication because the rates of perioperative complications were observed to be higher when compared to open cholecystectomy (1, 2). Improvements in operative skills and advances in instrumentation have allowed surgeons to attempt to treat inflamed gallbladders laparoscopically. This procedure has been reported to be safe (3, 4) but there are still limitations inherent in the two-dimensional view and lack of tactile sensation during laparoscopic surgery. These disadvantages are amplified in the presence of acute inflammation. Thus the conversion rate to open cholecystectomy is higher when compared to elective cases (5). The aim of this study was to define predictive factors of conversion in patients who had undergone early LC for acute cholecystitis.

Patients and method

The analysis was based on data of 108 patients who were admitted to the hospital between January 2002 and December

2007 on an emergency basis for acute cholecystitis and underwent laparoscopic cholecystectomy within 72 hours of the onset of their symptoms. The diagnosis of acute cholecystitis was based on right upper abdominal pain, positive Murphy sign, fever and/or leucocytosis, as well as USG findings matching acute cholecystitis such as thickened gallbladder wall, gallstones and pericholecystic fluid collection. In all patients, the definite diagnosis of acute cholecystitis was made during the operation and confirmed by histopathological examination.

All patients with acute cholecystitis except four had normal liver function, and no dilation or stones in the bile duct were observed. Of the four patients who were excluded from the study, two had common bile duct stones, one was pregnant and the other had possibly gallbladder cancer.

Operative Technique

The Standard four-trocar technique is used for all laparoscopic cholecystectomies. First, a 10 mm Hasson's trocar is inserted via open method in the subumbilical region. Three ports (10-mm epigastric and 2x5-mm on the right side along the subcostal margin) are inserted under direct vision. Needle decompression of the gallbladder is performed whenever necessary. Dissection commences at Calot's triangle using monopolar electrocautery. Operative cholangiograms are not routinely performed. After it is freed from the liver, the gallbladder is extracted through the subumbilical port site using an extraction bag. The decision for the conversion to laparotomy is based on the clinical judgement of the surgeon.

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Tab. 1. Patient characteristics.

	LC n=89	%*	Converted LC to OC n=19	%**
Sex Male	31	(34.83%)	9	(47.36%)
Female	58	(65.16%)	10	(52.63%)
Age >70 years	9	(10.11%)	6	(31.57%)
<70 years	80	(89.98%)	13	(68.42%)
BMI >30	4	(4.49%)	4	(21.05%)
T >37	14	(15.73%)	5	(26.31%)
DM	15	(16.85%)	3	(15.79%)
Elevated WBC	50	(56.17%)	10	(52.63%)
Previous abdominal operation	15	(16.85%)	3	(15.79%)
Pericholecystic fluid on ultrasound	22	(24.72%)	11	(57.89%)

BMI – body mass index, T – temperature, DM – diabetes mellitus, WBC – White blood cell count, LC – laparoscopic cholecystectomy, OC – open cholecystectomy, * – percentage in laparoscopic cholecystectomy group, ** – percentage in converted group

Tab. 2. Reasons for conversion (n=19).

Inability to display anatomy safely	15	(78.94%)
Bleeding from cystic artery	2	(10.53%)
Bleeding from gallbladder bed	2	(10.53%)

Data collection

Recorded patient data included age, gender, height, weight, history of abdominal operation, the highest preoperative temperature, white blood cell count and preoperative ultrasound evidence of acute cholecystitis defined as distended gallbladder, thickened gallbladder wall and pericholecystic fluid. Conversion to open cholecystectomy, length of hospital stay and complications were also recorded.

Statistical analysis

Univariate analysis was performed using the chi-squared test to determine factors associated with conversion to laparotomy; the odds ratios and their 95% confidence intervals were calculated. Linear regression analysis was then performed using all significant predictors obtained from univariate analysis. $p < 0.05$ was considered statistically significant.

Results

The patient population was comprised of 68 (62.9 %) women and 40 (37.1 %) men with mean age of 50.03 ± 14.59 (range, 26–83); 15 were 70 years old or older.

Nineteen patients had fevers above 37 °C, and 60 had preoperative leucocytosis. Eighteen patients had diabetes. On USG, 33 patients had pericholecystic fluid; the remaining 75 had hypodropic gallbladders with thickened walls but without pericholecystic fluid. Eighteen patients had undergone previous upper abdominal operations. The Body Mass Index (BMI) was 27.72 ± 1.91

Tab. 3. Complication rates and length of stay.

	LC	Converted LC to OC	Value
Cystic duct leakage	2	–	
Respiratory infection	1	2	
Wound Infection	–	2	
Myocardial ischemia	1	–	
Total complications	4	4	$p < 0.001$
Length of stay (days)	1.48 ± 0.65	5.79 ± 0.78	$p < 0.001$

LC – laparoscopic cholecystectomy, OC – open cholecystectomy

in patients with successful laparoscopic cholecystectomies and 29.15 ± 1.65 in patients who required conversion to open surgery (Tab. 1).

Nineteen of 108 patients (17.59 %) required conversion to open cholecystectomy. The most common reasons for conversion were severe inflammation and dense adhesions preventing accurate identification of the biliary anatomy in 15 patients. For the remaining four patients, the conversion was necessary because of uncontrollable bleeding. Two had uncontrollable hemorrhage from the gallbladder bed and the other two had uncontrollable hemorrhage from cystic artery (Tab. 2).

Two patients of the laparoscopic cholecystectomy group had bile leakage in postoperative period that was thought to originate from ductus cysticus as a result of clip slippage, at ERCP; a stent was replaced in the common bile duct, and percutaneous drainage was provided under USG guidance for successful treatment. Beside these two patients, one patient of the same group had a pulmonary infection, and one patient had cardiac ischemia that was treated medically. In the conversion group, two patients developed wound infections, and two patients had pulmonary infections. No mortality was observed in our study. The average hospital stay period was 1.48 days for the laparoscopic cholecystectomy group, and 5.79 days for the conversion group. The latter difference was statistically significant ($p < 0.001$) (Tab. 3).

Linear regression analysis revealed that advanced age ($p = 0.029$), obesity ($p = 0.024$) and pericholecystic fluid at USG ($p = 0.009$) were statistically significant risk factors for conversion.

Discussion

Laparoscopic cholecystectomy (LC) is now one of the most common laparoscopic surgeries performed at general surgery units. Because of perceived difficulties in dissection and the premise of unacceptably high complication rates, the presence of acute cholecystitis was once considered a relative contraindication for LC. As experience with the procedure has increased and available equipment has improved, LC has gained acceptance as surgical treatment for acute cholecystitis. However the risk of conversion to open cholecystectomy is always present (6, 7, 8).

LC patients with acute cholecystitis have significantly higher rates of conversion to open cholecystectomy, longer hospital stays and increased morbidity when compared to those who receive elective LC. The conversion rate reported in literature varies from

7 to 38 % (9, 10, 11). In this study, we retrospectively analysed 108 patients who were subduced to laparoscopic operations for acute cholecystitis. Nineteen patients (17.59 %) required conversion to open surgery due to the fact that safe completion of laparoscopic procedure could not be ensured. Conversion to laparotomy represents neither a failure nor a complication, but an attempt to avoid further complications. It may be helpful to determine parameters predicting the conversion beforehand. This would improve preoperative patient counseling and help to take extra precautions for reducing intra-operative complications (12, 13).

The findings of studies that attempt to define preoperative factors predicting the conversion to open cholecystectomy are contradictory. In our study, we evaluated the effects of patient characteristics on conversion, such as gender, age, body mass index (BMI), previous abdominal operation history and diabetes, as well as preoperative findings such as fever, leucocytosis, hydropic gallbladder and pericholecystic fluid showing the severity of acute cholecystitis. Although we found higher rates of conversion among male patients, the conversion rates of the two genders were not statistically significant ($p=0.304$). In literature, there is no consensus reached on this issue. Some investigators (14, 15, 16) suggest that gender affects the conversion risk, whereas others (17, 18) do not. Investigators suggesting that gender is a predictive factor also claim that male acute cholecystitis patients have denser brids at Calot's triangle and in the pericholecystic region than women, but fail in explaining the underlying pathophysiology.

Conversion rates in our study were found to be significantly higher in patients over the age of 70 ($p=0.029$). Increased age has been noted in literature as a preoperative risk factor for conversion, perhaps due to a longer history of gallstones and increased number of cholecystitis attacks (6, 19, 20). We also found that obesity independently predicted conversion to open cholecystectomy; it has been previously identified as a risk factor for conversion (13, 21). Explanations for higher conversion rate in the obese group may include difficult trocar placement, obscured anatomy because of excessive intraperitoneal fat, inability to retract the liver sufficiently and difficulty with instrument manipulation through excessively thick abdominal walls (21). We believe that cannulation via the open method using Hasson's trocar, the placement of an additional port for retraction of the liver and the use of longer instruments may have prevented some of these conversions.

Some researchers have suggested that the conversion rates are higher in diabetics (12, 22) but we did not find conversion rate and diabetes to be correlated ($p=0.283$). The reason for greater conversion rate in this group of patients is unclear. One explanation may involve the presence of more severe inflammation among diabetic patients with acute cholecystitis when compared to non-diabetics. Autonomic and peripheral neuropathy may prevent some diabetic patients from developing symptoms of gallbladder disease until later in the course of their illness. This may lead to a delay in diagnosis and can result in more advanced disease and greater risk of conversion (23, 24).

It has been suggested that the adhesions appearing after abdominal operations lead to complication of trocar replacement

and gallbladder dissection, thereby increasing the incidence of conversion in patients with history of previous abdominal operations (13, 16, 25). However, there is no consensus on this suggestion in literature. Lipman et al (12) reported that adhesions related to past operations might be in different locations and that adhesions near the gallbladder should not affect dissection; in addition, adhesions that appear during acute cholecystitis are denser, thus previous upper abdominal operations should not affect the conversion risk. We also observed that previous upper abdominal operations did not increase the incidence of conversion. We believe that the open technique that we used routinely from the subumbilical region at replacing the first port is effective in this.

Simopoulos et al classified conversion rates for acute cholecystitis based on gallbladder pathology as follows: these rates were 14 % for acute edematous cholecystitis, 15.5 % for hydrops, and 25.8 % for gallbladder empyema (20). In parallel with these findings, Lal et al reported that the difficulty of laparoscopic cholecystectomies could be determined preoperatively based on USG findings of the bladder (26). We also found significantly more conversions in cases showing pericholecystic fluid on USG ($p=0.009$). We believe that the presence of pericholecystic fluid arises from the translocation of fluid from the surrounding tissues during severe inflammation of the gallbladder. Fever and leucocytosis as results of acute gallbladder inflammation have been shown to be risk factors for conversion (12, 20). These studies included both, patients with acute and chronic cholecystitis and because these two parameters were associated with acute cholecystitis, they were determined to be risk factors for conversion. We did not determine the effects of fever and leucocytosis on conversion as our study included only patients with acute cholecystitis.

In conclusion, our study revealed that advanced age, obesity and pericholecystic fluid on USG are predictive risk factors for conversion in patients with acute cholecystitis. We believe that none of these risk factors contraindicates LC; however, they are good predictors of difficulty in LC.

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