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Predicting Conversion of Laparoscopic Cholecystectomy for Acute Cholecystitis

Cpt. Andrew J. Shapiro, MD, Cpt. Corey Costello, MD,
Ltc. Michael Harkabus, MD, Ltc. James H. North Jr, MD

ABSTRACT

Background and Objectives: Laparoscopic cholecystectomy can be safely performed in patients with acute cholecystitis. However, the rate of conversion to open cholecystectomy remains higher when compared with patients with chronic cholecystitis. Preoperative clinical or laboratory parameters that could predict the need for conversion may assist the surgeon in preoperative or intraoperative decision making. This could have cost-saving implications.

Methods: A retrospective review of 46 patients undergoing laparoscopic cholecystectomy for acute cholecystitis was performed. Records were assessed for preoperative clinical, laboratory and radiographic parameters on admission. Temperature and laboratory parameters were also recorded prior to surgery after an initial period of hospitalization that included intravenous antibiotics. The effect of admission and preoperative parameters as well as the trend in these parameters prior to surgery upon the rate of conversion to open cholecystectomy was assessed.

Results: Ten patients (22%) required conversion to open cholecystectomy. Conversion was required more often in males (43%) when compared with females (4%) (p=0.003). Conversion rate was 30% in patients with increased wall thickness by ultrasound compared with 12% for patients without wall thickening (p=ns). No admission or preoperative laboratory values predicted conversion. The trend in the patient's temperature (p=0.0003) and serum LDH value (p=0.043) predicted the need for conversion to open surgery.

Conclusions: Preoperative prediction of the need for open cholecystectomy remains elusive. Male patients and patients with rising temperature and LDH levels while on intravenous antibiotics require conversion at increased frequency. However, the benefits of laparoscopic cholecystectomy warrant an attempt at laparoscopic removal in most patients with acute cholecystitis.

Key Words: Acute cholecystitis, Laparoscopic cholecystectomy, Open cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy (LC) has been accepted as a safe and effective alternative to open cholecystectomy (OC) for the management of chronic biliary disease.[1,2] Advantages include a shortened hospital stay, decreased recovery time, reduction in postoperative pain, earlier return to full activity and an improved cosmetic result.[3,4] Acute cholecystitis was once considered a contraindication to LC.[5,6] This procedure is now safely applied for this indication with no increase in morbidity or mortality.[7] However, LC performed for acute cholecystitis has been associated with a five-fold increase in the conversion rate to OC.[8] Preoperative prediction of which patients will require conversion remains elusive. However, an accurate means of predicting patients in whom an attempt at LC would be fruitless has obvious cost-saving implications.

This study was undertaken to identify preoperative factors in patients with acute cholecystitis that would predict the need for conversion to OC. This could assist the surgeon in recognizing those patients at risk for conversion and assist in making the decision to convert.

METHODS AND MATERIALS

A retrospective review of 463 patients undergoing laparoscopic cholecystectomy between January 1, 1993 and December 31, 1996 was performed. Of these, 46 patients had a diagnosis of acute cholecystitis. Confirmation of acute cholecystitis was based upon the clinical findings of fever, right upper quadrant pain/tenderness, and an elevated white blood cell (WBC) count in patients with supporting ultrasound or HIDA scan

Eisenhower Army Medical Center, Fort Gordon, Georgia (all authors).

Address reprint request to: Ltc. James H. North Jr., MD, FACS, General Surgery Service, Eisenhower Army Medical Center, Ft. Gordon, Georgia 30905, USA.

findings and pathologic findings consistent with acute cholecystitis. This group forms the subject of this review.

Patient charts were reviewed for clinical parameters to include age and gender. Admission data was reviewed for temperature, length of symptoms, WBC, and liver enzymes to include lactate dehydrogenase (LDH), aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT), and total bilirubin. Amylase and lipase were also recorded. Results of imaging studies including ultrasound, CT scan, and HIDA scan were recorded. All patients were operated on during the initial hospitalization. Antibiotic therapy, trends in temperature, white blood cell count and lab parameters were recorded for the period between admission and surgery. The trend in temperature was determined by recording the maximum temperature for the 24-hour period following admission (Tmax) and the 24-hour period prior to surgery and recording the change. A change in temperature of <1 degree centigrade was recorded as unchanged. Trends in laboratory values were also evaluated. A change in the WBC count of plus or minus 2 x 10^3 cells per high power field was used to define an increasing or decreasing trend, respectively. LDH trends were determined by a change in the value of 25 IU/L. A difference of 10 IU/L for AST, ALT, amylase and lipase was utilized in recognizing trends in those values. A change in total bilirubin was defined as plus or minus 0.2 mg/dL from the original value.

For those patients requiring conversion to open cholecystectomy, length of time to conversion, reason for conversion and complications were reviewed. Statistical analysis was performed using chi-squared or the Fishers exact test where appropriate for discrete variables, and the independent T test was used for continuous variables. Statistical significance was defined as $p<0.05$.

RESULTS

During the period from January 1, 1993 to December 31, 1996, there were 463 laparoscopic cholecystectomies performed at Dwight D. Eisenhower Army Medical Center. Of these, 46 (9.9%) were performed for documented acute cholecystitis. Twenty-one patients were male and 25 were female. The average age was 54 years with a range from 18 to 81 years. The average length of symptoms prior to admission was 2 days (range 1 day to 14 days). Patient temperature at admission ranged from 35.7 to 39.9 degrees centigrade with a mean of 37.1 degrees centigrade. The average WBC count at admission was 13 with a range of 2.8 to 28. Thirty-seven patients had documented cholelithiasis, 29 patients with multiple stones and 8 patients with a single stone. Nine patients had acalculous cholecystitis.

Ten patients (21.7%) required conversion to open cholecystectomy. Adhesions were the most common reason for aborting the laparoscopic attempt (n=6). Open cholecystectomy was performed in two patients each for problems with visualization of the triangle of Calot due to edema and problems retracting a gangrenous gallbladder. The mean time to conversion was 68 minutes with a range of 30 to 180 minutes. Nine of the 21 (42.9%) male patients required conversion compared to 1 of the 25 (4%) females ($p=0.0027$).

Conversion was required in 6 of 20 (30%) patients noted to have sonographic evidence of wall thickness compared with 2 of 16 (12.5%) patients without increased wall thickness ($p=0.257$). Pericholicystic fluid was observed on ultrasound in 10 patients, only one (10%) of whom required conversion. This compares with conversion in 8 of 27 (30%) patients without pericholicystic fluid ($p=0.393$). For patients with a single stone, 2 of 8 (25%) were converted versus 7 of 29 (24%) patients with multiple stones. For those patients with acalculous cholecystitis, only 1 of 9 (11%) required completion with the open procedure ($p=0.688$).

All patients were treated with parenteral antibiotics on admission. Ampicillin/Sulbactam was the most commonly employed regimen. With the exception of gender, no difference in the rate of conversion to OC was found for any admission or preoperative parameters. Results of analysis of trends in clinical and laboratory parameters from the time of admission to surgery is shown in **Table 1**. Patients whose Tmax was rising prior to surgery were converted at a higher rate than both the groups with unchanged and decreasing Tmax, 100%, 17% and 60%, respectively ($p=0.0003$). Patients whose white blood cell counts trended upwards in the preoperative period required conversion in 2 of 8 patients (25%) compared with 2 of 9 (22%) and 6 of 15 (40%) patients with unchanged WBC counts and decreasing WBC counts, respectively ($p=0.098$). Lactate dehydrogenase was also found to be predictive of conversion. In patients whose LDH showed a rising trend, 2 of 3 (67%) required conversion compared to conversion in 1 of 12 and 5 of 13 patients with unchanged and decreasing LDH levels,

respectively (p=0.043). Trends for the period from admission to operation for AST, ALT, total bilirubin, amylase and lipase did not have a statistically significant impact upon conversion rates.

There were no complications in patients who underwent successful laparoscopic cholecystectomy. Only one complication was identified in those patients who required conversion. The complication was a colon laceration in a patient with a time to conversion of 180 minutes.

DISCUSSION

The safety of LC for acute cholecystitis is well documented.[1,2] This project was undertaken in order to identify preoperative factors that can aid the surgeon in predicting which patients will require conversion to OC. This information could potentially avoid a "doomed" laparoscopic attempt. It could also be used intraoperatively to assist the surgeon when considering whether to persist laparoscopically.

An increased rate of conversion from laparoscopic to open cholecystectomy with a range from 6.5% to 35% has been previously reported.[9-17] Our conversion rate of 21.7% is consistent with these findings. Adhesions have been repeatedly identified as the most common reason for conversion.[18-20] In our study, 80% of the conversions were performed due to adhesions or difficulty identifying the anatomy of Calot's triangle. The edema and inflammation associated with acute cholecystitis is believed to contribute to the significant amount of adhesions and anatomical distortion seen at the time of surgery.[21] While adhesions cannot be used as a preoperative predictive factor for conversion, they can be used to indicate a need for early conversion.[19]

We found the conversion rate to be higher among our male patients. This has previously been reported by Bickel and Fired.[22] Patients who present with inflamed, acute gallbladders are more likely to be male.[10,23] No other admission or preoperative clinical, radiographic, or laboratory parameter was found to be predictive of the need to convert to OC.

Analysis of trends in temperature found that patients with an increasing temperature prior to surgery required OC more often. In fact, all patients with a rising temperature required conversion. Temperature is one of the clinical parameters associated with severe inflammation. A rising temperature may be indicative of increasing inflammation, thus increasing the risk that LC may be unsuccessful. This can be a useful clinical parameter. Identifying those patients whose Tmax rises should alert the surgeon that the patient is at increased risk for requiring conversion to OC.

The trend in LDH was another factor identified as predictive of conversion. A rising LDH level may indicate worsening inflammation of the hepatic substance surrounding the inflamed gallbladder. Worsening inflammation may be indicative of gangrenous changes in the gallbladder or impending perforation. In these patients, challenges exist with both dissection and retraction of the gallbladder.

Table 1.
Univariate analysis of trends in clinical and laboratory parameters.

	CONVERSION RATE (%)			
FACTOR	TREND			p
	Rising	Unchanged	Decreasing	
Tmax	100	17	60	0.0003
LDH	67	8	39	0.043
WBC	20	22	40	0.098
ALT	67	19	30	0.15
AST	0	30	25	0.25
T. Bili	0	24	33	0.32
Amylase	0	19	22	0.56
Lipase	25	19	25	0.98

CONCLUSION

Acute cholecystitis is a risk factor for conversion to open cholecystectomy. Conversion to OC is more often required for male patients and in patients with a rising temperature and LDH. These factors, in combination with intraoperative findings of adhesions, edema and inflammation, may assist the surgeon with the decision to convert earlier. This may reduce the risk of morbidity and mortality and save operating room time and resources. While the results of this study may be used to guide the surgeon in the decision to convert early, the benefits of LC warrant an attempt at LC in most patients.

Conversion should not be viewed as a failure or complication but rather as a way to protect our patients by preventing potential complications.

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