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Factors Associated with Successful Laparoscopic Cholecystectomy for Acute Cholecystitis

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Objective

This article determined which preoperative data correlated with successful completion of a laparoscopic cholecystectomy in patients with acute cholecystitis.

Summary Background Data

Although laparoscopic cholecystectomy is the procedure of choice in chronic cholecystitis, its use in acute cholecystitis may be associated with higher costs and complication rates. It is not known which patients with acute cholecystitis are likely to require conversion to open cholecystectomy based on preoperative data or if a cooling-off period with medical therapy can diminish inflammation and increase the chance of successful laparoscopic cholecystectomy.

Methods

All laparoscopic cholecystectomies done by the authors between 10/90 and 2/92 were reviewed. Data on cases of acute cholecystitis were prospectively collected on standardized data forms.

Results

Twenty of 281 laparoscopic cholecystectomies were done for acute cholecystitis; 7/20 patients with acute cholecystitis required conversion to open cholecystectomy compared with 6/281 patients undergoing elective operation for chronic cholecystitis. In patients with acute cholecystitis the interval from admission to cholecystectomy in the successful cases was 0.6 days vs. 5 days in the cases requiring conversion to open cholecystectomy ($p = .01$). Cases requiring conversion to open cholecystectomy also had higher WBC (14.0 vs. 9.0, $p < .05$), alkaline phosphatase (206 vs. 81, $p < .02$, and APACHE II scores (10.6 vs. 5.1, $p < .05$). Ultrasonographic findings such as gallbladder distention, wall thickness, and pericholecystic fluid did not correlate with the success of laparoscopic cholecystectomy. Patients converted from laparoscopic to open cholecystectomy required more operating room time (120 min vs. 87 min, $p < .01$) and more postop hospital days (6 vs. 2, $p < .001$).

Conclusions

Laparoscopic cholecystectomy for acute cholecystitis should be done immediately after the diagnosis is established because delaying surgery allows inflammation to become more intense, thus increasing the technical difficulty of laparoscopic cholecystectomy.

The growth of laparoscopic cholecystectomy has revolutionized the management of biliary disease. Laparoscopic cholecystectomy is the preferred method for the treatment of chronic cholecystitis. Initially, conditions such as acute inflammation, cirrhosis, and previous upper abdominal surgery were believed to be contraindica-

tions to the procedure. As experience is gained, however, increasingly difficult operations are being attempted. Laparoscopic management of acute cholecystitis is a logical progression from elective laparoscopic cholecystectomy, but questions remain about its safety, cost effectiveness, and success rate. We therefore reviewed our experience to address these questions.

MATERIALS AND METHODS

Two hundred and eighty patients underwent laparoscopic cholecystectomy at The Massachusetts General Hospital between June 1, 1990 and February 1, 1992. During this period, 20 patients with acute cholecystitis underwent laparoscopic cholecystectomy. These patients were identified prospectively or concurrently on the basis of preoperative or intraoperative findings. All patients were operated on by the authors using a standard laparoscopic four puncture technique as popularized by Reddick and Olsen.[1] A fifth trocar was placed in the upper abdomen when necessary. Electrocautery was used in all cases.

The diagnosis of acute cholecystitis was made on the basis of: 1) clinical and laboratory evidence of inflammation (such as fever, leukocytosis, and acute tenderness over the gallbladder); 2) intraoperative findings of severe acute inflammation; 3) pathology report demonstrating acute cholecystitis. Patients with operative findings compatible with acute cholecystitis but without clinical and laboratory signs of acute inflammation or pathologic findings of acute cholecystitis were excluded.

Charts were reviewed retrospectively. Statistical analysis was done using Primer of Biostatistics software (McGraw-Hill Co., New York, NY). Comparison among groups was made using Student's unpaired t-test with Bonferonni's correction for interval variables and chi-square analysis of proportions; p values <0.05 were considered significant.

RESULTS

Thirteen patients were women and 7 were men. The average age was 57 years. All patients had right upper quadrant or epigastric pain and all had cholelithiasis; 7 of 20 patients required conversion to open cholecystectomy.

Symptoms

The pain was constant in 8 patients and colicky in 12. Five of 8 patients with constant pain required conversion to open cholecystectomy, whereas only 2 of 12 whose pain was predominately colic were converted (p = ns). The median duration of preoperative biliary pain in the conversion group was 3 days (range 2–30) in contrast to 21 days (range 2–90) in the successful group.

Timing of Surgery

Ten patients underwent cholecystectomy during their initial hospitalization. Five of these required conversion. Six patients were initially treated with antibiotics and subsequently scheduled for an elective laparoscopic cholecystectomy. Two of these six required conversion. Four patients had stuttering attacks of biliary colic, but did not require urgent hospitalization and were scheduled as elective laparoscopic cholecystectomies. All four of these patients were successfully treated via laparoscopic cholecystectomy and all had pathologically documented acute cholecystitis. The interval from admission to cholecystectomy was 0.6 days in the successfully treated cases versus 5 days in the converted cases ($p = 0.01$). This delay in performing cholecystectomy reflects delayed diagnosis as well as failed attempts at a cooling-off period.

Laboratory and Radiologic Findings

No jaundiced patients were included in this study. Although the SGOT was similar in the two groups (25 vs. 23), alkaline phosphatase was significantly higher in the conversion group (206 ± 183) than the successfully treated group (81 ± 22) ($p = 0.023$). The only recognized common duct stone in the series occurred in the successfully treated group and thus choledocholithiasis cannot explain this finding. The conversion group also had significantly higher WBC (14.0 ± 4.0 vs. 9.8 ± 3.0, $p = 0.05$) and APACHE II scores (10.6 ± 7.9 vs. 5.1 ± 3.3, $p = 0.04$).

Eleven patients had ultrasound examinations during the attack of acute cholecystitis. In these patients a distended gallbladder was seen in two of five successfully treated patients and in 4 of 6 converted patients. A thickened gallbladder wall was observed in three of five successfully treated patients and in four of six converted patients. Pericholecystic fluid was noted in three of five successfully treated patients, but not seen in any converted patients, whereas a stone impacted in the cystic duct was seen in two of five successfully treated cases and one of six converted cases. Nine patients who were known to have cholelithiasis based on prior ultrasound examinations did not have repeat examinations before surgery. HIDA scans are not routinely used in our institution.

Operative Procedures

Successful laparoscopic cholecystectomies for acute cholecystitis took a mean of 87 ± 22 minutes. Proce-

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dures requiring conversion to open cholecystectomy averaged 120 ± 25 minutes ($p = 0.007$) (Table 1). In the 7 failed cases an average of 45 minutes of laparoscopic surgery occurred before converting to an open approach. The causes for failure to complete the cholecystectomy laparoscopically were multiple. In all cases, the gallbladder was decompressed by aspiration. Both toothed and multipronged graspers were used. In spite of these maneuvers, failure to adequately grasp the gallbladder or creation of multiple tears in the gallbladder occurred in all failed cases. In 3 of 7 patients, inability to identify ductal anatomy lead to conversion. On several occasions, dissection commenced at the fundus of the gallbladder in an attempt to overcome this problem. This tactic was successful on one occasion. Difficulty dissecting an inflammatory mass from the gallbladder and difficulty in separating the gallbladder from the liver bed also contributed to failure (Table 2).

The postoperative stay averaged 2 days in the successfully treated group and 6 days in the converted group. There was one complication in each group. One patient in the successfully treated group returned to the hospital 1 week postoperatively with abdominal pain, hyperamylasemia, and an elevated alkaline phosphatase. An ERCP demonstrated an edematous ampulla with a normal cholangiogram believed to be consistent with the passage of a common duct stone. One patient in the conversion group had a wound infection in the subcostal incision as well as a low output bile leak through a drain, which closed by the seventh postoperative day. There were no deaths.

DISCUSSION

Laparoscopic cholecystectomy is the treatment of choice for most patients with symptomatic cholelithiasis. Initially, acute cholecystitis was believed to be a contraindication to this procedure.[2] As surgeons gained facility with this procedure, however, its use was expanded to acute cholecystitis. Initial series showed a high conversion rate in the presence of acute inflammation. In The Southern Surgeons Club report, unexpected acute inflammation was encountered in 14 patients (out of 1518 total patients) and lead to 8 conversions.[3] In two other early series, 41% and 60% of patients were converted to open cholecystectomy.[4,5] Several series have reported a higher success rate with conversion rates ranging from 7–33%.[6–9] In this report, which includes our early experience, the conversion rate was 35%.

Conversion of a laparoscopic cholecystectomy to an open procedure is meant to ensure the safety of the procedure. As surgeons gain greater confidence with laparoscopic cholecystectomy there is a tendency to persist with a difficult dissection to avoid opening. Thus conversion has become a marker for a truly difficult cholecystectomy. At our hospital, a regional referral center for hepatobiliary disease, the last five bile duct transections that we have repaired all occurred during laparoscopic cholecystectomy for acute cholecystitis. In three of the patients, bile duct injury occurred before performance of a cholangiogram. Furthermore, cholangiography performed through a clipped and cut "cystic duct" is too late to prevent injury if the common duct has been misidentified as the cystic duct. Although there are many series that show the safety of laparoscopic cholecystectomy, the true incidence of bile duct injury is undoubtedly higher than that which is reported from the leading centers. Furthermore, the early series that showed low incidence of bile duct injury contained few, if any cases of acute cholecystitis. In our recent experience, most bile duct injuries occur in cases of acute cholecystitis and are not prevented by intraoperative cholangiography. The merit of intraoperative cholangiography in the setting of acute cholecystitis, however, is the recognition of an injury that can be immediately repaired and also detection of common duct stones that may be present in up to 10% of patients with acute cholecystitis.

The economic impact of a converted open cholecystectomy is also substantial. Because laparoscopic cholecystectomy for acute cholecystitis requires more operating room time than typical elective cholecystectomy (either open or laparoscopic), involves extra costs for equipment and nursing personal (compared with open cholecystectomy), and has a longer hospital stay than elective laparoscopic cholecystectomy, conversion to open surgery combines the worst of both procedures in terms of cost.[10]

We retrospectively reviewed our experience with laparoscopic cholecystectomy to identify those factors associated with failure of the laparoscopic procedure. Clinical parameters associated with severe inflammation such as degree of leukocytosis, degree of alkaline phosphatase elevation, and the APACHE II score were significantly associated with failure of the procedure. There were no ultrasonographic findings in this series that correlated with the difficulty of the procedure although the data are limited. These findings are consistent with the report by Jacobs that the ability to perform a laparoscopic cholecystectomy is directly related to the severity of the inflammatory response.[9]

Perhaps the most important predictor of the success of attempted laparoscopic cholecystectomy in these patients was the timing of surgery. There was a highly significant difference in the length of hospitalization before surgery among those who underwent successful and unsuccessful laparoscopic cholecystectomies (Table 1). Patients undergoing surgery within 48 hours of admission to the hospital had successful procedures whereas those operated on later in the course of illness had inflammation that was too severe to permit safe laparoscopic cho-

lecystectomy. This finding is consistent with the well known progression of pathomorphologic changes in acute cholecystitis. In the early stages of the illness, edema and hyperemia are prominent. As inflammation progresses, however, induration, hypervascularity, abscess formation, and necrosis occur. These latter factors are responsible for the inability to adequately retract the gallbladder (induration and necrosis) and delineate ductal structures (hypervascularity and induration) that necessitate conversion to open surgery (Table 2). Patients with a prolonged interval from onset of symptoms to diagnosis (especially if in hospital) and those with evidence of severe inflammation are at high risk for conversion to open cholecystectomy. The uniform success of laparoscopic cholecystectomy in patients with stuttering attacks of cholecystitis who underwent scheduled (albeit urgent) laparoscopic cholecystectomy reflects a milder degree of inflammation in spite of the longer duration of symptoms.

Six patients who developed acute cholecystitis were initially treated nonoperatively with antibiotics and scheduled for elective laparoscopic cholecystectomy after the original attack. Two of these patients required conversion to open cholecystectomy (33%) which is similar to the conversion rate for this series as a whole. If a laparoscopic cholecystectomy can be performed early during the course of the initial attack there seems to be little benefit to initial medical therapy followed by an interval cholecystectomy. There is little evidence to show that a cooling-off period will reduce the rate of conversion to open cholecystectomy in these patients. Furthermore, some patients will not "cool off" on medical therapy and thus will need urgent surgery. Therefore, the optimal timing for surgery is as soon as possible after establishment of the diagnosis of acute cholecystitis.

Table 1. COMPARISON OF SUCCESSFUL AND UNSUCCESSFUL LAPAROSCOPIC CHOLECYSTECTOMIES

	Success	Failure	p
# Patients	13	7	
Pre-op hospital days	0.6	5.0	0.01
Serum alkaline phosphatase (IU/l)	81	206	0.02
WBC (×10/mm)	9.0	14.0	0.05
APACHE II	5.1	10.6	0.05
Operative time (minutes)	87	120	0.01
Post-op hospital days	2	6	0.001

Table 2. FACTORS CONTRIBUTING TO FAILURE IN LAPAROSCOPIC CHOLECYSTECTOMY

	# Cases
Difficulty grasping gallbladder	4
Multiple tears in the gallbladder	4
Inabito identify ducts	3
Inability to separate gallbladder from liver bed	3
Inability to separate inflammatory mass	3

We have shown that laparoscopic cholecystectomy can be performed safely in patients with acute cholecystitis provided a low threshold for conversion to open cholecystectomy is maintained. When a gangrenous gallbladder that cannot be grasped and that becomes morselated during attempts to separate it from the liver is encountered, conversion to open cholecystectomy should occur. The benefits of completing a suboptimal procedure through the laparoscope are outweighed by the hazards of bile duct injury and postoperative sepsis. In cases of severe advanced cholecystitis, open cholecystectomy should be considered both for the safety of the patient and for cost effectiveness. Only prospective randomized trials will be able to compare the safety and cost efficacy of laparoscopic cholecystectomy and open cholecystectomy in this group of patients.

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