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Laparoscopic Cholecystectomy for Acute Inflammation of the Gallbladder

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Objective.
The aim of this study was to prospectively assess the results of laparoscopic cholecystectomy in patients with acute inflammation of the gallbladder.

Summary Background Data.
Laparoscopic cholecystectomy has become the standard treatment for symptomatic gallbladder disease. Its role in the surgical treatment of acute cholecystitis has not been defined, although a number of recent reports suggest that there should be few contraindications to an initial laparoscopic approach.

Methods.
All patients presenting with symptomatic cholelithiasis from October 1990 until June 1992 were evaluated at laparoscopy with intention of proceeding to a laparoscopic cholecystectomy. The gross appearance of the gallbladder was categorized as acute inflammation, chronic inflammation, or no inflammation. Ninety-eight (23.4%) of 418 patients had acute inflammation of the gallbladder: 55 were edematous, 10 were gangrenous, 15 had a mucocele, and 18 had an empyema.

Results.
The authors assessed outcome in these patients. The frequency of conversion to an open operation was 33.7% for acute inflammation, 21.7% for chronic inflammation ($p < 0.05$), and 4% for no inflammation ($p < 0.001$). The conversion rate was highest for empyema (83.3%) and gangrenous cholecystitis (50%), while the conversion rate for edematous cholecystitis was 21.8% and for acute inflammation with a mucocele it was 7%. The median operation time for successful laparoscopic cholecystectomy for acute inflammation was 105 minutes, which was longer than that with no inflammation (90 minutes). However, the incidence of complications was not different from that for chronic or no inflammation. The median postoperative stay for patients with acute gallbladder inflammation was 2 days for successful laparoscopic cholecystectomy and 7 days for patients converted to an open operation.

Conclusions.
Laparoscopic cholecystectomy for acute inflammation of the gallbladder is safe and is associated with a significantly shorter postoperative stay compared to open surgery. A greater number of

patients require conversion to open operation compared to those with no obvious inflammation. Conversion to open operation was most frequent for empyema and gangrenous cholecystitis, suggesting that once this diagnosis is made, excessive time should not be spent in laparoscopic trial dissection before converting to an open operation.

Laparoscopic cholecystectomy has become the accepted method for the treatment of symptomatic gallstones. Acute cholecystitis has been considered a contraindication to performing laparoscopic cholecystectomy because of perceived technical difficulties.[1-5] In addition, there was a belief that the complication rate and the risk of major duct injury may be higher. Greater experience with laparoscopic cholecystectomy has led many centers to attempt laparoscopic cholecystectomy in patients with a diagnosis of acute cholecystitis.[3,6-9] However, the role of laparoscopic cholecystectomy in the treatment of the acutely inflamed gallbladder has not been clearly established. The aim of this study was to assess prospectively the results of laparoscopic cholecystectomy in patients with an acutely inflamed gallbladder at the time of surgery.

METHODS

A prospective evaluation of all patients undergoing laparoscopic cholecystectomy was undertaken between October 1990 and June 1992. All patients had preoperative, operative, and postoperative data recorded. These data were stored and analyzed using a personal computer and data processing software. Laparoscopic cholecystectomy was attempted in all patients with symptomatic gallbladder disease, except those with known extensive adhesions at previous abdominal surgery, known portal hypertension, and large stones in the common bile duct (CBD) demonstrated on preoperative endoscopic retrograde cholangiography (ERCP). Patients with a clinical diagnosis of acute cholecystitis had an early laparoscopic cholecystectomy, usually within 72 hours of admission.

The degree of gallbladder inflammation was assessed by the surgeon at laparoscopy. There were four types of acute inflammation: acute inflammation with pericholecystic edema (edematous cholecystitis), with gangrene (gangrenous cholecystitis), with mucus noted on gallbladder aspiration (mucocele), or with pus on gallbladder aspiration (empyema). Chronic inflammation was defined as a thickened gallbladder wall with evidence of fibrosis in the anatomical plane between the gallbladder and the liver. When neither of the features of acute or chronic inflammation were present, the gallbladder was categorized as not inflamed.

Additional data recorded included patient demographics, results of operative cholangiography, conversion to open cholecystectomy and the reason for conversion, operative duration, length of postoperative stay, and any postoperative complications.

The duration of operation was taken from the time of the initial skin incision to the time of skin closure. The postoperative stay was taken as the number of nights the patient stayed in the hospital after the procedure.

Statistical comparison was performed using the chi squared test or the Wilcoxon rank sum test.[10] Statistical significance was accepted when the value of p was less than 0.05.

RESULTS

Laparoscopic cholecystectomy was attempted in 418 patients with symptomatic gallbladder disease during the period from October 1990 to June 1992. Ninety-eight patients (23.4%) were assessed laparoscopically to have an acutely inflamed gallbladder. One hundred twenty (28%) patients had a chronically inflamed gallbladder and 200 (48.6%) patients had symptomatic gallstones but no obvious inflammation. Of the patients with acute inflammation, there were 44 men and 54 women (median age, 57 years; age range, 13 to 90 years). Fifty-one (56.1%) had edematous cholecystitis, 15 (15.3%) had a mucocele associated with acute inflammation, 10 (10.2%) had gangrenous cholecystitis, and 18 (18.4%) had an empyema.

Conversion from laparoscopic to open cholecystectomy in the presence of acute cholecystitis occurred in 33 (33.7%) patients. This compares with a conversion rate of 21.7% for patients with chronic inflammation and 4.0% for patients with no inflammation. The conversion rate in the presence of acute or chronic inflammation was significantly higher than that for cases with no obvious inflammation (chi square = 48.81 and $p < 0.0001$; chi square = 24.65 and $p < 0.0001$, respectively). The conversion rate for acute inflammation was also significantly greater (chi square = 3.94 and $p < 0.05$) than that for chronic inflammation. Within the subgroups of patients with acute cholecystitis, the conversion rate was

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Table 1. POSTOPERATIVE MORBIDITY

Patient Complications	Acute (n = 98)	Chronic (n = 120)	No (n = 200)
Common hepatic duct injury	1	0	0
Bile leak	3	4	2
Pancreatitis	0	1	2
Ileus	1	1	3
Wound infection	2	3	2
Atelectasis	4	4	1
Pneumonia	1	1	0
Deep vein thrombosis	0	1	3
Death	1	1	0
Total	13	16	13

83.3% for an empyema, 50% for gangrenous cholecystitis, 21.8% for edematous cholecystitis, and 7% for a mucocele.

The reasons for conversion to open cholecystectomy were difficult laparoscopic dissection (n = 26), open exploration of the CBD (n = 4), instrument failure (n = 1), a damaged common hepatic duct (n = 1), and a carbon dioxide embolus (n = 1). The most common causes of difficult dissection were either inability to adequately retract the inflamed gallbladder and dissect the cystic duct (n = 15), or friability of the gallbladder (n = 7). In three patients dense adhesions to the colon and duodenum prevented further dissection, and in one patient a congenital rib cage deformity prevented adequate retraction.

The median duration of operation for a successful laparoscopic cholecystectomy for acute inflammation was 105 minutes (range, 60 to 195 minutes). The median operative duration for no inflammation was 90 minutes (range, 40 to 300 minutes), which was significantly shorter than that for acute inflammation (Wilcoxon rank sum; $Z = 3.07$ and $p < 0.01$). The median operation time for patients with a chronic inflammation was 100 minutes (range, 45 to 200 minutes), which was similar to that for acute inflammation but longer than that for no inflammation (Wilcoxon rank sum; $Z = 0.78$ and $p < 0.2$; $Z = 2.49$ and $p < 0.05$, respectively).

Operative cholangiography was attempted in all patients with acute inflammation and successfully performed in 81 (80.8%). CBD calculi were demonstrated in 14 of the 81 patients: 3 had the stones flushed into the duodenum after relaxation of the sphincter of Oddi with intravenous glucagon or buscopan, 5 proceeded to open CBD exploration, and the remaining 6 had a postoperative ERCP.

There were 12 complications in the patients with acute inflammation (Table 1). There was one duct injury: a 1-mm side hole in the common hepatic duct that was recognized during dissection in Calot's triangle. This patient had stones demonstrated in the CBD on operative cholangiography and the operation was converted to open. The CBD was explored through an enlarged choledochotomy at the site of the side hole, the stones were removed, and the duct was closed over a T-tube with no subsequent complications. Three patients had postoperative bile leaks. One patient was managed successfully by insertion of a percutaneous drain under radiological control to drain the collection. Another drained bile for 4 days through a drain inserted at the operation. The drainage ceased spontaneously with no further complications. The third patient had a CBD stone noted on operative cholangiogram that was left *in situ*. The bile leak was drained with a percutaneous drain and an ERCP and sphincterotomy were performed to remove the stone. No bile leak could be demonstrated at ERCP.

The complications in patients with chronic (n = 17) and no (n = 14) inflammation were similar to those for acute inflammation (Table 1). There was one death in the group of patients with acute inflammation. A 69-year-old man who required conversion to open operation for an empyema had a pulmonary embolus and died on the ninth postoperative day.

The median postoperative hospital stay after a successful laparoscopic cholecystectomy for acute inflammation was 2 days (range, 1 to 22 days), while for patients converted to open cholecystectomy it was 7 days (range, 3 to 20 days) (Wilcoxon rank sum; $Z = 4.19$ and $p < 0.001$). The median postoperative hospital stay for patients with no inflammation was 1 day (range, 1 to 20 days), which was significantly shorter than that for patients with acute inflammation (Wilcoxon rank sum; $Z = 3.53$ and $p < 0.001$). The median postoperative stay for patients with chronic inflammation was 2 days (range, 1 to 19 days), which was not significantly different from either acute or no inflammation (Wilcoxon rank sum; $Z = 2.06$ and $p < 0.05$; $Z = 1.57$ and $p > 0.1$, respectively).

DISCUSSION

During the initial experience of laparoscopic cholecystectomy, acute cholecystitis was considered to be a contraindication.[1–4,7] However, with increasing experience, the successful treatment of patients with acute inflammation by laparoscopic cholecystectomy was reported.[6–9] Encouraged by these results, we undertook a prospective evaluation of our laparoscopic experience in treating patients with acute inflammation. We used a simple grading system to assess inflammation based on the laparoscopic appearance and correlated this with subsequent outcome.

The proportion of acute inflammation in our series was 23.4%, which is much higher than the 2% to 10% reported in most other laparoscopic series[1–4,7,9,11–15] but similar to that of 14% to 35% in series of open cholecystectomy.[16–20] Before the advent of laparoscopic cholecystectomy, the usual treatment of patients with acute cholecystitis was an early (within 3 or 4 days of admission) open cholecystectomy. This practice evolved from studies that documented a benefit, in terms of the total length of inpatient stay, for early cholecystectomy *versus* initial nonoperative treatment and interval cholecystectomy at a subsequent admission.[21–23] Hence, our aim has been to perform laparoscopic cholecystectomy early (within 72 hours) during the acute admission.

Although there was a significantly higher conversion rate to open operation in patients with acute inflammation compared to patients with no obvious inflammation, the majority of procedures could be completed laparoscopically. Of major importance was the safety of this approach, as indicated by the lack of significant complications. There was a single bile duct injury in this series: a side hole in the common hepatic duct. This injury was readily recognized and managed with no long-term complications. The incidence of bile leaks (3%) is comparable with that seen after open cholecystectomy for acute cholecystitis[20] and in this series was no higher than that in patients with chronic or no inflammation.

Analysis of the types of acute cholecystitis revealed that patients with an empyema or gangrenous cholecystitis were most likely to require conversion to open operation. The high conversion rate for an empyema was a consequence of the combination of dense but friable adhesions to the gallbladder wall and the thick, fibrous wall that made laparoscopic dissection and retraction of the gallbladder difficult. The high conversion rate for gangrenous cholecystitis was usually due to the excessive friability of the gallbladder wall. In another series, gangrenous cholecystitis was associated with a 30% conversion rate, but the conversion rate for empyema has not been previously reported.[6]

Patients with acute inflammation had the same complication rate as patients with chronic or no inflammation. This compares favorably with a 36.5% complication rate for open cholecystectomy in a similar unselected group of patients with acute cholecystitis.[20] The majority of complications after open cholecystectomy for acute cholecystitis are pulmonary,[20] whereas after laparoscopic cholecystectomy the incidence of pulmonary complications was low.

Although postoperative hospital stay was longer in patients with acute inflammation compared to no inflammation, it was still appreciably shorter than that for patients who had their operation converted to an open cholecystectomy.

The results of this series support the recommendation that patients with acute cholecystitis should undergo early laparoscopic assessment with the intention of proceeding to a laparoscopic cholecystectomy. If, on initial dissection, an empyema or gangrenous cholecystitis is found and satisfactory progress with the dissection is not possible, conversion to open cholecystectomy should be considered early.

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