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Laparoscopic Cholecystectomy: a Safe Approach for Management of Acute Cholecystitis

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ABSTRACT

Background and Objectives: Laparoscopic cholecystectomy (LC) is increasingly being used as an appropriate early treatment in patients with cholecystitis. This study evaluated the safety, effectiveness, and complications of LC in all cases of acute cholecystitis.

Methods: A retrospective study involved the patients who underwent LC for acute cholecystitis within 72 hours of admission. The preoperative diagnosis was based on clinical, laboratory, and echographic examinations, while the final diagnosis was confirmed by histopathological examination of the excised gallbladder.

Results: We identified 184 patients with acute cholecystitis. Intraoperative cholangiography (IOC) was not performed. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) was performed in 62 patients (33.7%), and postoperative ERCP in 13 patients (7.1%). Conversion to open cholecystectomy was necessary in 19 patients (10.3%); 16 patients for severe inflammation and adhesions and 3 patients because of uncontrolled bleeding. The mean operative time was 68 minutes. No deaths occurred. The overall complication rate was 6% with 3 postoperative bile leakages and 2 nonbilious subhepatic collections. The mean postoperative hospital stay was 2.8 days.

Conclusions: LC is a safe, effective procedure for the early management of patients with acute cholecystitis. LC can be safely performed without routine IOC when ERCP is performed preoperatively on the basis of specific indications. Meticulous dissection and good exposure of Calot's triangle may prevent bile duct injuries.

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INTRODUCTION

Acute cholecystitis (AC) often requires emergency admission to the hospital. The traditional treatment of AC was conservative followed by cholecystectomy, usually 6 weeks to 8 weeks after discharge, although early cholecystectomy in patients with AC was shown to be safe and effective many years ago.[1]

Laparoscopic cholecystectomy (LC) for an acutely inflamed gallbladder is technically more demanding than surgery for acute biliary pain without inflammation (biliary colic) because of severe inflammatory adhesions and distortion of the biliary anatomy; and the time interval from admission to surgery may affect conversion rates.[2–4] Because of perceived difficulties in dissection and the premise of unacceptably high complication rates, the presence of AC was once considered an absolute contraindication to the performance of LC. However, as experience with the procedure has increased and with improvements in available equipment, LC is increasingly being used as the initial surgical approach in the majority of patients with AC.[5,6] Randomized trials have also shown that early LC (within 72 hours of admission) for the treatment of AC is safe, feasible, and associated with a shorter hospital stay.[7–9]

In this study, we have retrospectively reviewed the early management of all patients admitted to the First Surgical Department at Evangelismos General Hospital of Athens with acute gallbladder disease over 7 years to evaluate whether LC within 72 hours of patients' admission predisposes to a high or low risk of complications, mortality, and conversion to open cholecystectomy and whether it reduces the postoperative length of hospital stay.

METHODS

Between January 1999 and December 2005, 184 patients were identified who were admitted to the hospital on an

emergency basis for acute gallbladder disease and underwent urgent LC within 72 hours. Of these patients, 107 (58.2%) were women and 77 (41.8%) were men. The mean age was 56.2 years (range, 23 to 71). The mean duration of symptoms was 2.3 days (range, 1.0 to 3.0).

The diagnosis of AC was based on clinical features (right upper quadrant tenderness with or without fever ≥37.5°C) and ultrasonographic features suggestive of inflammation (gallbladder wall thickness >5 mm, edematous wall, emphysematous wall, gallbladder distension, pericholecystic fluid, positive ultrasonographic Murphy's sign) and/or leucocytosis >10,000/μL. Bacteriological specimens were not collected routinely at the time of surgery. The diagnosis of AC was finally confirmed by histopathological examination of the excised gallbladder.

Data analyzed included demographic information, clinical presentation, and results of laboratory and imaging studies, initial surgical approach, operative data, and outcome (morbidity, mortality, and postoperative hospital stay). Patients with gallstone pancreatitis and gallstone ileus were excluded from the study.

Treatment

Three surgeons (VV, PA, and EH) with special interest in LC performed the procedures. The policy of our department required that all patients initially undergo LC; however, some of them were not suitable for LC because of anatomic or pathologic factors and were converted to open cholecystectomy.

Preoperative treatment included intravenous fluids and appropriate antibiotics (cephalosporin with metronidazole or clindamycin). These agents were continued for at least 24 hours in the postoperative period.

Preoperative assessment included abdominal ultrasound (US) and preoperative endoscopic retrograde cholangiopancreatography (ERCP). All patients underwent abdominal US, while preoperative ERCP was performed on the basis of the following indications: common bile duct (CBD) dilated more than 7mm, current or past jaundice, or abnormal liver function with high levels of bilirubin, liver enzymes, or alkaline phosphatase. Preoperative sphincterotomy and stone extraction were performed in all the patients with CBD stones.

In patients with perioperative hyperbilirubinemia without biochemical evidence of common bile duct (CBD) stones or ductal dilatation, the LC alone was performed with postoperative ERCP being reserved for patients whose bilirubin levels failed to normalize following surgery; while the patients with CBD stones at cholecystectomy or missed CBD stones underwent postoperative ERCP. Intraoperative cholangiography (IOC) was not performed in our series.

LC was performed by using the standard 4-trocar technique with the patient under general anesthesia with endotracheal intubation. Placement of the umbilical trocar was made under direct vision using the Hasson technique.[10] Patients underwent LC with several modifications to the standard surgical technique used as appropriate: decompression of a tense, distended gallbladder with an epidural needle to enable secure grasping of the fundus, placing of a suture to hitch the body of the gallbladder to the anterior abdominal wall to facilitate dissection in Calot's triangle, and blunt dissection to identify the cystic duct and removal of a perforated gallbladder in an endobag. The drain was not systematically left in the patient.

Table 1 shows the histological findings in patients who had early surgery, and **Table 2** lists the clinical, ultrasonographic, and laboratory findings.

RESULTS

Of the 184 patients identified, 150 (81.5%) had stones on preoperative US, and 34 (18.4%) had acute acalculous cholecystitis. The comorbid medical illnesses in 28 (15.2%) of the patients included hypertension (n=13), diabetes mellitus (n=8), ischemic heart disease (n=5), and chronic obstructive pulmonary disease (n=2).

Preoperative ERCP was performed in 62 patients (33.7%); CBD stones were found in 43 of these (69.3%). ERCP was also performed postoperatively in 13 patients (7%); in 4 patients, bilirubin levels failed to normalize following surgery, and 9 patients had CBD stones at cholecystectomy or missed CBD stones.

No mortality or major CBD injury occurred. The overall complication rate was 6% (n=11). Three patients had cystic duct stump leakage with biloma; these patients were man-

Table 1.
Histological Findings in 184 Patients With Acute Cholecystitis Who Underwent Early Laparoscopic Cholecystectomy

Finding	n (%)
Acute inflammation	138 (75)
Empyema	29 (15.7)
Gangrene	13 (7.1)
Gangrene with empyema	4 (2.2)

Table 2.
Clinical, Ultrasonographic, and Laboratory Findings in 184 Patients With Acute Cholecystitis Who Underwent Early Laparoscopic Cholecystectomy

Finding	n (%)
Clinical presentation	
Right upper quadrant pain	172 (93.5)
Fever	96 (52.2)
Jaundice	16 (8.7)
Ultrasonographic findings	
Gallbladder wall thickened >5 mm	129 (70.1)
Edematous wall	38 (20.6)
Pericholecystic fluid	17 (9.2)
Positive ultrasonographic Murphy's sign	27 (14.7)
Stones within gallbladder	150 (81.5)
Distended gallbladder	2 (1.1)
Emphysematous wall	6 (3.3)
Laboratory findings	
Leucocytosis	167 (90.8)
Elevated alkaline phosphatase	28 (15.2)
Elevated bilirubin	66 (35.9)
Elevated alanine aminotransferase	32 (17.4)
Elevated aspartate aminotransferase	21 (11.4)

aged successfully by endoscopic stent placement with percutaneous drainage of the biloma. Two patients had postoperative nonbilious subhepatic collection, which was aspirated under ultrasonographic guidance. The complications following LC are shown in **Table 3**.

Nineteen patients were converted to open cholecystectomy (10.3%). Sixteen patients who required conversion to open cholecystectomy had severe inflammation processes and severe adhesions that obscured the plane of dissection and anatomy around Calot's triangle and made further dissection hazardous; conversion was also necessary in 3 patients because of uncontrolled bleeding.

The median duration of surgery was 68 minutes (range, 51 to 98). The median postoperative hospital stay was 2.8 days (range, 2 to 7).

DISCUSSION

This study examined the urgent laparoscopic management of patients admitted for AC in a district general hospital. The study comprised a large series of patients with various ranges of AC managed laparoscopically, with a low conversion rate, acceptable operating time and complication rate and a short hospital stay. It was also demonstrated that patients with specific clinical and laboratory findings could be managed with pre- or postoperative ERCP with or without sphincterotomy without the performance of IOC.

AC is the chemical or bacterial inflammation of the gallbladder. Its severity ranges from mild edema and inflammation, constituting simple AC, to more severe disease with empyema and even hemorrhagic or gangrenous changes involving the wall of the gallbladder. Despite initial reservations regarding feasibility and safety of the procedure in AC, LC is increasingly being successfully used as the initial surgical approach in the majority of these patients.

The clinical presentation of AC comprises right upper quadrant pain, fever or jaundice, or both. Laboratory findings include liver function test abnormalities and leucocytosis. In this study, right upper quadrant pain and fever were observed in 93.5% and 52.2% of patients, respectively; jaundice was present in 16 (8.7%) patients. Leucocytosis and elevated bilirubin were the most common laboratory findings in 167 and 66 patients, respectively.

Abdominal US is the initial imaging modality of choice. The presence of gallstones, gallbladder wall thickening, and pericholecystic fluid are the most common ultrasonographic findings. The presence of air in the gallbladder wall, intraluminal membranes, and marked irregularity of the gallbladder wall are features more specific for gangrenous cholecystitis.[11] In our series, the most common ultrasonographic findings were stones within the gallbladder, gallbladder wall thickness >5 mm and edematous gallbladder wall. Based on clinical, laboratory, and imaging findings, a preoperative diagnosis of AC was made in all patients.

It has been suggested that the optimum timing for urgent

Table 3.
Complications Following Laparoscopic Cholecystectomy

Complication	No. of Patients
Cystic duct leak	3
Subhepatic collection	2
Respiratory infection	3
Wound infection	1
Umbilical hernia	2
Total	11/184 (6%)

cholecystectomy is within 72 hours of admission or within 7 days of the onset of symptoms.[12] Furthermore, failure to perform cholecystectomy within 72 hours of admission to the hospital might be an indication for interval cholecystectomy.[13] This was based on the finding that the conversion rate was seen to rise sharply after 72 hours from admission, negating the potential benefits of urgent surgery. Lo et al[7] observed that the presence of dense, fibrous adhesions in the delayed group made laparoscopic dissection difficult and unsafe. Furthermore, repeated attacks during the period of conservative treatment necessitated emergency surgery.[8] Others have found the optimum timing for surgery to be within 96 hours of admission, with longer delays leading to a rising conversion rate.[14,15] The present results support the findings of earlier studies; in our series, all patients underwent early LC within 72 hours from their admission.

Sixty-two patients in whom a high suspicion existed of choledocholithiasis (significantly abnormal liver function test results or an abnormal biliary tree on ultrasonography, or both) underwent preoperative endoscopic retrograde cholangiopancreatography (ERCP) because of the unavailability of suitable equipment for laparoscopic CBD exploration at our institution. Preoperative sphincterotomy and stone extraction were performed in all the patients with CBD stones (n=43). ERCP was performed postoperatively in 13 patients. Nine patients were found to have CBD stones at cholecystectomy or missed CBD stones; while postoperative ERCP was reserved for 4 patients whose bilirubin levels failed to normalize following surgery.

The rising conversion rate associated with a delay in urgent cholecystectomy is related to the stage of the acute inflammatory process. In the early edematous phase, a plane exists between the gallbladder and the surrounding viscera that assists in dissection. Once the inflammation begins to settle, scarring occurs that renders dissection more difficult. Other reported risk factors for conversion include old age,[14,16] large stones,[16] a nonpalpable gallbladder,[14] gangrenous cholecystitis,[14] and the presence of pericholecystic fluid or edema and thickening of the gallbladder wall.[17] It has also been suggested that the chronicity of gallbladder disease may be an important determinant for conversion to open surgery.[16] In the current study, 12 of 17 patients (70.6%) with gangrenous cholecystitis (gangrene or gangrene with empyema) and 6 of 17 patients (35.3%) with preoperative evidence of pericholecystic fluid collection on abdominal US underwent conversion to open surgery. Pericholecystic fluid obscures the anatomy and tissue planes, making dissection difficult. Three patients underwent conversion to open cholecystectomy because of uncontrolled bleeding. Conversion in these patients must, however, not be considered a complication, but rather an effort to prevent complications.

The median duration of surgery (68 minutes) compared favorably with that reported in several randomized trials.[18,19] If severe adhesions were present, no additional trocars were placed, and the procedure was converted to the open technique. If the region of the gallbladder could be accessed, a careful evaluation of the gallbladder was carried out. Adequate healthy tissue was usually present more proximally in the region of the body and infundibulum. This allowed for grasping the gallbladder and providing the traction necessary for safe dissection in the region of the triangle of Calot. If the entire gallbladder was necrotic or if the severity of the inflammation precluded safe dissection, the procedure was similarly converted to an open one. The time taken to make these determinations did not add significantly to the duration of the surgery.

The overall complication rate in this series (6%) is lower than that observed in other large laparoscopic series for AC.[6,9,20] No mortalities or CBD injuries occurred. Three patients had cystic duct stump leaks and 2 had nonbilious subhepatic collections that were treated with conservative methods. The bile leakages mainly linked to an incomplete control of the cystic duct. We believe that in patients with an enlarged cystic duct because of inflammation or a stone, it is necessary to secure the duct with a suture or a loop. We also observed 1 wound infection, 2 umbilical postoperative hernias, and 3 respiratory infections. These results confirm that in LC the cosmetic results are improved and the rate of postoperative herniation and wound infections are decreased. Finally, the overall hospital stay was short in the present study. This is in accordance with other authors' reports.[6,18,20]

The present results support the idea that patients with specific clinical and laboratory findings can be managed with pre- or postoperative ERCP without the performance of IOC. The same results have also been reported in other studies.[21,22] However, controversy exists as to whether IOC should be performed routinely or selectively during LC. Some authors advocate routine use of IOC,[23,24] while others advocate selective IOC[25–27] when selection criteria, such as dilation of CBD, abnormal liver function tests, and history of jaundice are satisfied. Whether routine IOC reduces the incidence of CBD injuries or increases the incidence of asymptomatic or retained CBD stones, remains controversial. Ladocsi et al[27] showed that rou-

tine IOC did not increase CBD stone detection and did not decrease CBD injuries but increased the average duration of surgery, the total cost of the procedure, and the conversion rate to open surgery in comparison with the selective IOC. Some studies show a protective effect of IOC for CBD injuries,[28,29] while others conclude that routine IOC cannot completely prevent CBD injuries, but it may be helpful for the identification and repair of them.[23] In a prospective study of 3,145 LCs with routine IOC,[30] only 5 CBD injuries were identified intraoperatively; one of them occurred after a persistent attempt to perform cholangiography.

We are not convinced that the good results reported can be attributed to the routine use of IOC, because most of the CBD injuries occur during the dissection of the cystic duct before the performance of IOC. We believe that meticulous dissection with identification of anatomical landmarks is the key for safe LC, and IOC should not be used as a substitute for it.[31] IOC may decrease the incidence of CBD injuries or their extent, but this fact does not necessitate its routine use. IOC should be reserved for cases where doubt exists about the anatomy of the extrahepatic biliary tree or when CBD stones are suspected. In this study, patients with suspected CBD stones successfully underwent preoperative ERCP and CBD clearance because no facilities are available for laparoscopic CBD exploration at our institution. Thus, the use of IOC for detection of CBD stones was not necessary. We also did not use IOC for identification of anatomy. When in doubt, we converted to open surgery. One may argue that if we had performed an IOC our conversion rates could have been less. A definitive answer does not exist, but this is very likely. The optimal treatment of CBD stones is highly dependent on the available facilities. Preoperative ERCP, laparoscopic CBD exploration, conversion to open surgery, intraoperative ERCP, and postoperative ERCP are all acceptable for the management of CBD with a preference for minimal invasive techniques when they are available.

CONCLUSION

Early LC is a safe, effective procedure for managing patients with various ranges of AC. It is associated with low conversion and complication rates, reducing the length of overall hospital stay and improving the postoperative cosmetic results. When surgery is performed within 72 hours of admission, in experienced hands, LC represents the treatment of choice for AC. Pericholecystic collections and patients with gangrenous cholecystitis are associated with a higher risk of conversion to open cholecystectomy. LC can be also safely performed without IOC. ERCP should be performed preoperatively in patients in whom a high suspicion exists of choledocholithiasis or postoperatively on the basis of specific indications.

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