

Outcome of Managing Patients with Acute Cholecystitis in a Specialized Emergency Surgery Unit

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Abstract

Purpose: To assess the outcome of patients with acute cholecystitis attended in the Specialized Emergency Surgery Unit over a 15-month period.

Methods: A retrospective study of all consecutive patients with acute cholecystitis attended in the emergency room of a tertiary care hospital in Barcelona (Spain) was performed. Treatment included early or late (after failure of initial medical management) laparoscopic cholecystectomy and i.v. antibiotics alone as definitive therapy.

Results: Of a total of 181 patients, 70.7% underwent early laparoscopic cholecystectomy and the remaining 53 were initially managed conservatively. Tokyo II and III grades were recorded in 69.5% of cases. The mean number of comorbid conditions was 2.3 ± 1.5 (range 0-8). The rate of failure of conservative management was 18.9%. A total of 138 (76.2%) ultimately underwent laparoscopic surgery. Two (1.4%) patients required conversion to open surgery. Intraoperative complications occurred in 23 patients (16.7%) (Hemorrhage in 19 patients) and postoperative complications in 32 (23.2%). The overall mortality rate was 3.3%.

Conclusions: In patients with complex acute cholecystitis and a high rate of comorbidity, early laparoscopic cholecystectomy was successfully performed in 71% of patients. The high level of specialization of the surgical team may be an important factor in obtaining these results.

Keywords: Acute cholecystitis; Laparoscopic cholecystectomy; Outcome; Specialized surgical team.

Introduction

Acute cholecystitis is the most common complication of cholelithiasis, with an incidence of 10% in patients with symptomatic gallstone disease [1, 2]. Although the etiopathogenesis of acute cholecystitis was already well defined in the clinical series published a century ago [3], the management of patients with this condition remains a controversial topic. Currently, there is still a debate between appropriateness of medical or surgical treatment [4], as well as the feasibility and risks of the laparoscopic approach for gallbladder removal [4, 5]. In the 90's and because of the increase in complications related to the limited experience with laparoscopic procedures, a therapeutic strategy was to postpone laparoscopic surgery to a second step after an initial treatment with antibiotics [1, 6]. However, due to the large experience acquired in recent years with techniques of minimally invasive surgery, patients with acute cholecystitis are currently considered candidates for primary laparoscopic surgery [7, 8].

General surgery has evolved to the development of areas of specialized care for patients with different pathologic conditions. In this respect, subspecialties in colorectal surgery, bariatric surgery, endocrine surgery and others have improved the results obtained in the treatment of these patients [9-11]. However, for different reasons, this scenario has not applied in clinical practice to emergency surgery, which continues to be attended by a large variety of specialists both in the hospitals and in the outpatient setting.

In our institution, an urban teaching hospital in Barcelona, Spain, the presence of staff surgeons exclusively dedicated to the management of urgent surgical diseases since 2004, provides a more specialized and individualized care in the emergency setting. The objective of this study was to assess the outcome of patients with acute cholecystitis attended in the Specialized Emergency Surgery Unit over a 15-month period and to determine factors involved in the decision to treat patients surgically or medically.

Patients and Methods

All consecutive patients with acute cholecystitis attended in the emergency room of Hospital Clinic, an

acute-care 850-bed university-affiliated hospital in Barcelona (Spain), with a reference population of 540,000 inhabitants, during the 15 months from January 1, 2014 to March 31, 2014 were identified via a computerized search of the database of the emergency department.

The diagnosis of acute cholecystitis was made on the basis of a combination of clinical findings at clinical examination (right upper quadrant tenderness and Murphy sign), laboratory data (white blood cell count $> 11,000$ cells/mm³), and sonographic evidence of gallstones, thickened gallbladder wall or edema (double wall sign), pericholecystic fluid and/or sonographic Murphy sign. Selected patients underwent abdominal computed tomography (CT) scan. The severity of acute cholecystitis is classified into three grades, mild (grade I), moderate (grade II), and severe (grade III) according to the Tokyo guidelines [12]. Patients with concomitant cholangitis, isolated gallstone pancreatitis and choledocholithiasis were excluded.

Initial evaluation in the emergency department was conducted by a resident (postgraduate year 4 or 5) supervised by an attending surgeon. Operative decisions were made at the discretion of the attending surgeon. Patients were divided into the following three groups: *a*) early laparoscopic cholecystectomy within 24 hours of admission, *b*) late laparoscopic cholecystectomy, after medical management with intravenous antibiotic therapy failed during the index admission, indicated by persistent right upper quadrant tenderness and leukocytosis, and *c*) intravenous antibiotic therapy alone as definitive therapy during the index admission. Laparoscopic cholecystectomy was performed via the standard multi-port technique by experienced attending surgeons. Intraoperative cholangiography was highly selected. All patients were fully informed about the characteristics of the laparoscopic surgical procedure and other possible therapeutic options, as well as the possibility that conversion to an open procedure could be required at the time of operation. The study was approved by the Ethics Committee of our institution. Written informed consent was obtained from all participants.

Medical records were abstracted for demographic data; underlying conditions; previous surgery; American Society of Anesthesiology (ASA) classification; severity of acute cholecystitis (Tokyo grade); clinical features; laboratory data; sonographic findings; antibiotic therapy; operative data; conversion to open cholecystectomy; histopathologic findings; complications; length of hospital stay; and mortality.

Statistical Analysis

A comparison was made between the groups of patients undergoing laparoscopic cholecystectomy and patients initially treated conservatively. Categorical variables were compared with the chi-square (χ^2) test and continuous variables with the Student's t test for independent samples. Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 14 for Windows. Statistical significance was set at $p < 0.05$.

Results

During the study period, a total of 1807 patients were admitted to the emergency department. The reason for admission was acute cholecystitis in 181 patients (10%). Of these 181 patients, 128 (70.7%) patients underwent early laparoscopic cholecystectomy and the remaining 53 were

initially managed conservatively. All patients presented with abdominal pain, although only 91 (50.3%) referred pain in the upper right quadrant. The Murphy sign was positive in 66 (36.5%) patients. The diagnosis was established by abdominal ultrasound in 168 (92.8%) patients and by abdominal CT in the remaining 13. Gallstones in the gallbladder were the cause of acute cholecystitis in 162 patients.

The characteristics of patients at admission to the emergency department are shown in Table 1. Patients in the medical treatment group were significantly older than those in the surgical group (mean [\pm standard deviation, SD] age 76.7 ± 14.2 vs. 62.1 ± 18.4 years, $p < 0.001$) and showed a higher number of underlying conditions, particularly heart diseases and cognitive impairment, were treated with a higher number of drugs, received anti-platelet drugs more frequently, showed a higher severity of acute cholecystitis and ASA class, serum bilirubin > 3 mg/dL, and a positive sonographic Murphy sign.

Table 1: General characteristics of the 181 patients with acute cholecystitis attended in the emergency department undergoing early laparoscopic cholecystectomy or treated medically

	Surgical group (n=128)	Medical group (n=53)	P value
Men/women	67/61	32/31	0.323
Age, years, mean \pm SD (range)	62.1 \pm 18.4 (24-92)	66.4 \pm 18.5 (24-100)	<0.001
Underlying conditions, mean \pm SD (range)	1.61 \pm 1.4 (0-8)	3.1 \pm 1.6 (0-7)	<0.001
Hypertension	57 (44.5)	32 (60.4)	0.052
Ischemic heart disease	10 (7.8)	14 (26.4)	0.001
Arrhythmia	13 (10.2)	15 (28.3)	0.002
Diabetes mellitus	25 (19.5)	15 (28.3)	0.196
Chronic obstructive pulmonary disease	6 (4.7)	7 (13.2)	0.043
Chronic liver disease	0	2 (3.8)	0.027
Cognitive impairment	1 (0.8)	8 (15.1)	<0.001
Acute cerebrovascular events	4 (3.1)	9 (17.0)	0.001
Hepatobiliary and pancreatic disease	19 (14.8)	14 (26.4)	0.067
≥ 2 conditions	62 (48.4)	45 (84.9)	<0.001
Previous abdominal surgery	30 (23.4)	13 (24.5)	0.875
Pharmacological treatment (≥ 3 drugs)	27 (21.1)	27 (50.9)	<0.001
Anti-platelet agents	10 (7.8)	14 (26.4)	<0.001
ASA status			
I	28 (21.9)	3 (5.7)	0.005

II	63 (49.2)	14 (26.4)	0.005
III	35 (27.3)	29 (54.7)	<0.001
IV	2 (1.6)	7 (13.2)	0.001
Tokyo severity grade			
I	39 (30.5)	9 (17)	0.061
II	81 (63.5)	43 (81.1)	0.019
III	8 (6.3)	1 (1.9)	0.219
Temperature > 37°C	25 (19.5)	15 (28.3)	0.243
Presence of symptoms > 72 hours	21 (16.4)	12 (22.6)	0.323
Bilirubin > 3 mg/dL	9 (7.1)	9 (17)	<0.001
White blood cell count, cells/mm ³ , mean ± SD	13,738 ± 5437	12,711 ± 4559	
Sonographic findings			
Murphy sign	50 (39.1)	31 (58.5)	0.017
Thickened walls	62 (48.4)	27 (50.9)	0.759
Double wall sign	26 (20.3)	9 (17)	0.606
Dilatation biliary tree	12 (9.4)	13 (24.5)	0.191

Data as frequencies and percentages in parenthesis unless otherwise stated.

Of the 53 patients who were initially managed non-operatively with intravenous antibiotic therapy, 10 patients failed to improve with antibiotic treatment alone (percutaneous cholecystostomy was performed in one patient) and underwent laparoscopic cholecystectomy. The rate of failure of conservative management was 18.9%. Surgery was initially contraindicated because of a large number of comorbidities ($n = 8$) or laboratory evidence of cholestasis ($n = 2$). The mean age of these patients was 77.9 ± 10.6 years (range 55-91) and the mean number of comorbidities was 3.6 ± 2 (range 1-7). Twelve (27.9%) patients required readmission to the hospital because of cholelithiasis-related complications in 7 (new episode of acute cholecystitis 4, cholangitis 4, choledocholithiasis 1) and decompensation of the underlying illness in 5.

Forty-three patients (23.7%) were only managed conservatively. Indications for medical treatment alone included a high number of comorbid conditions in 24 patients, cholestasis in 4, important cognitive impairment in 3, long-lasting clinical course in 3, anti-platelet treatment in 3, and previous supramesocolic surgery in 2 and anticoagulation therapy in 1 and patient's refusal in 3.

Cholecystostomy was also performed in 2 patients, percutaneous drainage of perigallbladder fluid collection in 2 and endoscopic retrograde cholangiopancreatography (ERCP) in 2. The mean length of stay was 8.3 ± 8.1 days (range 2-50), with a median of 6 days.

Of the 181 patients, 76.2% ultimately underwent surgery ($n = 138$). A total of 125 (90.6%) patients were operated on between 8 and 22 hours after admission. All patients underwent laparoscopic cholecystectomy but 2 patients required conversion to open surgery because of adhesions ($n = 1$) and intraoperative hemorrhage ($n = 1$). The mean operative time was 91.3 ± 34.7 minutes (range 25-191). Details of operation are shown in Table 2. Intraoperative complications occurred in 23 patients (16.7%). Hemorrhage was the most frequent complication (19 patients). Postoperative complications were recorded in 32 patients (23.2%). Four patients had a bile leak and all of them were treated conservatively except for one patient who required placement of a biliary endoprosthesis through ERCP. Perioperative complications in the surgical group are described in Table 3. The mean length of stay was 5.6 ± 5.8 days (range 0.5-43), with a median of 4 days.

Table 2: Details of 138 patients with acute cholecystitis attended in the emergency department undergoing surgical treatment

	Number (%)
Laparoscopic approach	136 (98.5)
Conversion to open surgery	2 (1.4)
Operative time, minutes, mean \pm SD (range)	91.3 \pm 34.7 (25-191)
American position	136 (100)
Pneumoperitoneum with Veress needle	121 (89)
Number of trocars	
Three	113 (83.7)
Four	21 (15.6)
Intraoperative decompression of the gallbladder	53 (39)
Drainage insertion	115 (83.3)
Intraoperative cholangiography	4 (2.9)

Data as frequencies and percentages in parenthesis unless otherwise stated.

Table 3: Intraoperative and postoperative complications in 138 patients with acute cholecystitis attended in the emergency department undergoing surgical treatment

Complications	No. patients (%)	Treatment
Intraoperative	23 (16.7)*	
Hemorrhage	19 (13.8)	Hemostatic material (<i>n</i> = 8) Conversion open surgery (<i>n</i> = 1)
Surgical bed	14	
Arterial	2	
Inflammatory adjacent tissue	2	
Trocars	1	
Postoperative	32 (23.2)	
Related to the surgical procedure	10 (7.2)	
Bile leak	4	Conservative management (<i>n</i> = 3) Endoprosthesis ERCP (<i>n</i> = 1)
Intraabdominal collection	3 [†]	Antibiotic therapy (<i>n</i> = 3) Ultrasound-guided percutaneous drain (<i>n</i> = 1)
Bleeding	2	
Loop incarceration umbilical trocar	1	

Unrelated to the surgical procedure	22 (15.9)	
Fever without focus	3 [†]	
Myocardial infarction	1 [*]	
Pneumonia	3 [*]	
Arrhythmia	3 [*]	
Multiorgan dysfunction	4 [*]	
Decompensation underlying illness	4 [†]	
Urine retention	2	
Catheter-related bacteremia	2	

*Patients were initially treated with i.v. antibiotics without success (intraoperative complications 3, myocardial infarction 1, pneumonia 1, and arrhythmia 1).

†Readmission to the hospital within 30 days after discharge (intraabdominal collection 1, fever without focus 2, decompensation of underlying illness 2).

Histopathological findings revealed simple cholecystitis in 92 patients, gangrenous cholecystitis in 41, and xanthogranulomatous cholecystitis in 4 and adenocarcinoma in 1.

A total of 6 patients died, with an overall mortality rate of 3.3%. In the group of patients initially treated with i.v. antibiotics, 4 patients died (mortality rate 5.7%) (Two of these patients were subsequently operated on). The mortality rate among patients treated surgically was 3.6% (5/138) and the mortality rate in patients undergoing early laparoscopic cholecystectomy was 2.3% (3/128). When patients were classified according to ASA status, there were three deaths among ASA III patients (4.6%) and three among ASA IV patients (33.3%).

Discussion

Acute cholecystitis remains a frequent reason of admission to the emergency department, and accounted for 10% of admission in our institution. In this respect, it may be considered a reliable indicator of the quality of care provided in a surgical emergency service.

Most of the previous clinical series of acute cholecystitis reported the results obtained in patients treated surgically [13-17], which provides a partial perspective of the outcome and prevents the comparison among different

series. For this reason, we have presented the overall results obtained in patients diagnosed of acute cholecystitis divided according to the initial therapeutic approach and also according to the final treatment received [4,18]. Factors that influenced on the decision of the type of treatment recommended were mainly associated with the patient's characteristics (age, number of comorbid conditions, anesthetic risk, polypharmacy, use of anti-platelet drugs) as well as laboratory evidence of cholestasis and severity of acute cholecystitis (Tokyo II). On the other hand, patients initially managed medically or surgically did not show statistically significant differences regarding history of hepatobiliary and pancreatic diseases, previous abdominal surgery, use of anticoagulants or duration of symptoms.

Laparoscopic access that in the past years was even considered a contraindication in patients with acute cholecystitis [1, 19] has been currently gaining acceptance among digestive surgeons [4, 8, 17, 20, 21]. The rate of 76.2% of surgical treatment in patients with acute cholecystitis is lower than that found in other studies in which ranged between 29.8% and 50%) [8, 18, 22]. This datum, however, is not reported in randomized clinical studies comparing laparoscopic *versus* open surgery. The surgical approach was initially by laparoscopy in 98.5% of cases, which is higher than the rate of 85% previously reported [8]. Conversion to open surgery was necessary in only 1.4% of patients, which is very lower than percentages between 4.6% and 35.6% published by others [1, 5, 8, 16, 17, 21, 23, 24].

In the two patients in whom conversion to open surgery was required, reasons were hemorrhage in one case and adhesions in the other. Poorly defined anatomy secondary to inflammation which is the most common reason for conversion to open surgery in other series of acute cholecystitis [25] was not recorded in our study. Also, 81 patients (65.3%) with grade II (Tokyo) acute cholecystitis were candidates for laparoscopic surgery. In these patients, the rate of conversion to open surgery (2.5%) is much lower than rates of 28.6% and 41.7% reported in complex cases of acute cholecystitis [26, 27]. The high rate of conversion to open surgery is one of the reasons argued for the contraindication of an early laparoscopic cholecystectomy in patients with acute cholecystitis [8, 17]. The present results show that in centers with large experience, the rate of conversion to open surgery is low even for patients with complex disease [28]. In all of our patients, cholecystectomy could be completed and in none of the patients intraoperative cholecystostomy or subtotal cholecystectomy was necessary [8, 29]. According to the present results, laparoscopic cholecystectomy is not only a feasible procedure in patients with severe acute cholecystitis but also may be considered the technique of choice in patients in whom the surgical option is not contraindicated on the basis of the presence of comorbid conditions [8].

However, this inflammatory process in patients with multiple underlying diseases is associated with medical and surgical complications in the postoperative period, and mortality rates are not negligible (0-10%) [2, 8]. In the majority of cases, surgical complications resolved with conservative management. Mortality was closely related to comorbidities as shown by differences in death rates according to ASA grades. Bile leak occurred in four patients and was successfully managed with conservative treatment in three of them. One patient required placement of an endoprosthesis via ERCP. Intraabdominal collection developed in three patients, all of them were treated with antibiotics but in one case, ultrasound-guided percutaneous

drainage was performed. Common bile duct lesions were not recorded. The increase in the incidence of this complication published at the introduction of laparoscopic techniques was due to the lack of experience [25].

In relation to the surgical technique, all patients were placed in the American position and in most cases; surgery was completed with only three trocars. Previous decompression of the inflamed and tense gallbladder using a Veress needle facilitated dissection. A high rate of readmissions due to hepatobiliopancreatic pathologies among patients initially treated with antibiotics but ultimately treated surgically was registered. Early surgical treatment of acute cholecystitis is the only definitive treatment of this condition [1].

It should be noted that one of the characteristics of our hospital is that surgical patients admitted to the emergency department are attended by four staff surgeons exclusively dedicated to this area. This peculiarity has not been mentioned in previous studies. We believe that this specialization would allow obtaining better overall results as has been reported for other areas of surgery [9-11, 25, 28].

In summary, in a large series of patients with acute cholecystitis (Tokyo II and III grades in 69.5% of cases) and a high rate of comorbid conditions, early laparoscopic cholecystectomy was successfully performed in 71% of patients, with a very low rate of conversion to open surgery (1.4%). The high level of specialization of the surgical team may be an important factor in obtaining these results.

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