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Original Article

The outcome of early laparoscopic surgery to treat acute cholecystitis: a single-center experience

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Abstract: Aim: The aim of this study was to prospectively assess the outcome of early laparoscopic cholecystectomy (LC) in patients with acute cholecystitis. Materials and methods: Between July 2005 and December 2012, of 623 patients who had symptoms of acute cholecystitis during the first 72 h of hospital admission and who did not respond to non-operative treatment, 302 underwent surgical treatment. After initial treatment, all patients were followed up for 21 months on average (range: 5-27 months). The clinical, biochemical, radiological, and operative data of the 302 consecutive patients with acute cholecystitis were recorded and analyzed prospectively. Results: Of the 302 patients who underwent LC for acute cholecystitis, 169 were females and 133 males. Their mean ages were 47.8 years (range: 17-79 years) and 53.3 years (range: 27-90 years) respectively. Conversion to open surgery was required in 32 patients (10.5%). The mean postoperative length of hospital stay was 2 days (range: 1-3 days) in the LC group and 3 days (range: 2-6 days) in the conversion group. Significant differences between the successful LC group and the conversion group were evident terms of the length of postoperative hospitalization and gallbladder wall thickness (P=0.023). Factors associated with conversion were male gender, pericholecystic collection observed via ultrasound, gangrenous cholecystitis, and gallbladder wall thickness >1 cm. We experienced two minor bile duct injury complications that were treated via T tube placement. No mortality occurred. Ten patients suffered infections at the incisional locations, and eight patients developed lung infections. Conclusion: Early LC is safe in patients with acute cholecystitis. Male gender, pericholecystic collection determined via ultrasound, gangrenous cholecystitis, and gallbladder wall thickness >1 cm are associated with a higher risk of conversion to open surgery.

Keywords: Acute cholecystitis, laparoscopic cholecystectomy, conversion to open surgery

Introduction

The standard treatment for symptomatic cholecystitis associated with gallstones is cholecystectomy [1]. Laparoscopic cholecystectomy (LC) has replaced conventional open cholecystectomy and has become the gold standard of treatment for acute cholecystitis (AC). In recent years, laparoscopic surgery has been confirmed to be preferable to open surgery in elective cholecystectomy cases. Open cholecystectomy (OC) used to be preferred because of the technical difficulties and the high complication rates associated with LC [2]. However, several studies have shown that LC is safe and can be recommended as a form of cholecystectomy. Moreover, in treatment of AC (that comprises 20% of gallbladder disease), LC has become the gold standard procedure [3-5]. Many studies have demonstrated the safety of LC used to treat acute cholecystitis within 72 h of attack [6, 7]. It remains true that, in cases of acute cholecystitis, the complication rate of laparoscopic surgery and the rate of conversion to open surgery remain higher than those of cases of chronic cholecystitis. Compared to chronic cholecystitis, the LC complication and conversion rates remain higher than those associated with acute cholecystitis.

In the present study, we evaluated the outcomes of early LC used to treat AC.

Materials and methods

LC was performed on 3,745 cases of symptomatic cholelithiasis between July 2005 and

Table 1. Clinical and demographic findings of patients with acute cholecystitis

Variable	Successful laparoscopic surgery cases (n=270)	Conversion to open surgery cases (n=32)	*P* value
Age in years (range)	53.3±10 (27-90)	47±9 (20-79)	NS
Gender, male/female	114/156	19/13	0.001
Fever >37.5°C	111 (41%)	17 (53%)	NS
White blood cell, $\times 10^9$/L (range)	13±3 (5-22)	13±3 (6-26)	NS
C-reactive protein, mg/dL (range)	147±71 (55-301)	153±78 (42-339)	NS
Radiographic findings, gallbladder wall thickness in mm (range)	6.8±1.2 (5-16)	10.9±1.3 (5-21)	0.023
Pericholecystic fluid	70 (25%)	17 (53%)	0.023
Ultrasonographic Murphy sign	137 (50.7%)	21 (65%)	NS
Histopathological findings (chronic cholecystitis/gangrenous + phlegmonous cholecystitis)	125/75	3/23	0.023

NS: not significant.

December 2012 at Safa Hospital General Surgery department. Of these 3,745 cases, 623 had acute cholecystitis. The prospective diagnostic and analytical criteria for acute cholecystitis included age, gender, body mass index (BMI), temperature >37°C, pain in the right upper quadrant, a positive Murphy sign, a white blood count (WBC) >10×10^9/L, a C-reactive protein (CRP) level >4 mg/dL, pericholecystic collection, and the thickness of the gallbladder wall (**Table 1**).

AC was diagnosed in patients presenting with right upper abdominal pain and gallstones who had at least three of the symptoms listed in **Table 1**. Medical treatment was initiated in 321 AC cases who presented to our clinic. Twelve cases did not respond to medical treatment and underwent emergency surgery 110 (90-220 h) after onset of complaints. These 12 patients were excluded from the study. Cases that responded to medical treatment were discharged from the hospital but advised to present within 6-8 weeks for elective LC. A total of 302 cases diagnosed with AC underwent surgery within 72 h of the onset of complaints. Of these cases, those who underwent successful laparoscopic surgery were compared to those who underwent conversion to open surgery.

Statistical analysis

The Chi-squared test and Student's *t*-test were used to compare the two groups. The Kruskal-Wallis test with the Bonferroni correction was employed to analyze the differences between groups, and the non-parametric Mann-Whitney *U*-test was also applied. A *P* value less than 0.05 was accepted as significant.

Results

Of the 302 patients who underwent LC, 133 (44.0%) were males, and 169 (56.9%) females. The mean age of successful LC patients was 53.3±10 years (range: 27-90 years), and the mean age of patients requiring conversion to open surgery was 47.8±9 years (range: 20-79 years). Conversion to open surgery was required in 32 (10.5%) of the 302 patients. Of such patients, 19 (59.3%) were males, and 13 (40.6%) females. Cholecystectomy materials were examined histopathologically, and those from 125 (46.2%) cases were indicative of acute exacerbation based on chronic cholecystitis; 52 (19.2%) cases had gangrenous cholecystitis; 23 (8.5%) cases were diagnosed with phlegmonous cholecystitis; 14 (5.1%) cases were diagnosed with subacute cholecystitis, 55 (20.3%) cases had AC, and 1 case had an adenocarcinoma. Among those who underwent conversion to open surgery, histopathological examination of the retrieved materials revealed gangrenous cholecystitis in 14 cases and phlegmonous cholecystitis in 9. Acute exacerbations based on chronic cholecystitis were diagnosed in three conversion patients, and adenocarcinoma in one.

In terms of histopathological findings, the rate of conversion to open surgery was 43.7% in patients with gangrenous cholecystitis, 28.1% in those with phlegmonous cholecystitis, 15.6% in AC patients, and 9.3% in patients with chronic cholecystitis. The rate of conversion to open surgery was significantly higher in patients with phlegmonous and gangrenous cholecystitis ($P<0.05$).

Table 2. Outcomes of treatment of acute cholecystitis in the two groups

Variable	Successful laparoscopic surgery cases (n=270)	Conversion to open surgery cases (n=32)	*P* value
Operative time in min (range)	105±28 (49-163)	115±39 (54-195)	NS
(Conversion to open surgery)			
Difficulty with dissection	-	2	
Uncontrolled bleeding	-	6	
Adhesions	-	19	
Wound infection	6	4	NS
Post-operative hospital stay in days (range)	2.1±0.8 (1-3)	3.1±2.5 (2-7)	0.023
Drain use	129 (47%)	27 (84%)	0.001
Complications	6 (0.22%)	12 (37.5%)	0.003
Bile leakage	2	1	
Subhepatic fluid collection	1	3	
Choleocholithiasis	0	3	
Atelectasis	3	5	

NS: not significant.

The mean gallbladder wall thickness was 6.8±1.2 mm (range: 5-16 mm) in patients in whom surgeries were completed laparoscopically and 10.9±1.3 mm (range: 5-21 mm) in cases of conversion. The gallbladder wall thickness was 5-9 mm in only nine cases of conversion; the wall thickness of the remaining cases was >10 mm. Twelve cases that presented with AC and that did not respond to medical treatment within 72 h underwent emergency surgery at a mean of 110 h (range: 90-210 h). Five of these cases underwent conversion surgery: four were male, and one female. The gallbladder wall thickness of these cases (measured via ultrasound) was 14 mm, and histopathological examination revealed three cases of gangrenous cholecystitis, one case of AC, and one case of phlegmonous cholecystitis. The reasons for the conversion to open surgery were adhesions in 19 cases, bleeding in 6, suspected choledocholithiasis in 3, bile duct injury in 2, and technical difficulty in 2. The two cases with bile duct injuries were managed via primary repair and T-tube placement. The three cases of suspected choledocholithiasis were treated using T-tubes.

The mean time of hospital stay was 2.1±0.8 days (range: 1-3 days) for cases completed laparoscopically and 3.1±2.5 days (range: 2-6 days) for cases that underwent conversion surgery.

Post-operative complications included incision trocar site infection in six cases that underwent successful laparoscopic surgery and respiratory tract infections in three patients. Incision site infections developed in four cases of conversion and lung infections in five (**Table 2**).

Discussion

Today, LC is the preferred treatment for symptomatic cholecystolithiasis. Previously, LC was considered to be contraindicated in AC cases [5]. However, many studies have now reported that LC can be safely performed by experienced surgeons on AC patients [8, 9]. Nevertheless, the rate of intraoperative conversion from laparoscopy to open surgery remains rather high in AC cases; the literature values range from 6-35% [8-10]. The risks associated with conversion to open surgery in AC cases are mostly attributable to pericholecystic inflammation and adhesions. In addition to these risks, dissection difficulties and insufficient definition of the anatomy of the region are also problematic. Furthermore, bleeding and bile duct injuries are frequent complications triggering conversion. In the present study, the rate of conversion to open surgery was consistent with that reported in the literature, being 10.5% (12 cases). The main reasons for conversion were adhesions that led to dissection difficulties, bleeding, bile duct injuries, and technical difficulties. Bile duct injury during LC is a very serious complication associated with high morbidity. The most common complication, bile leakage from the cystic duct stump, was likely caused by slippage of surgical clips because of retained com-

mon bile duct stones or resolution of inflammation. During the era when open surgery was more frequently preferred, bile duct injuries were reported at a rate of 0.1-0.2%; however, in the early years after the laparoscopic approach was introduced, this rate increased to 0.8-1.4%. In subsequent years, however, the rate has decreased to 0.5-0.6% [10, 11]. In our series, bile duct injury occurred in two (1.1%) cases and were primarily repaired, followed by placement of a T-tube.

The choice of appropriate timing of LC for acute cholecystitis patients is important. Many studies have proposed that elective LC be performed either early or late, or after medical treatment of acute inflammation [12-15]. At the early stage, LC dissection is easier, and definition of the anatomy of the region is better because of minimal inflammation and fibrosis. However, in such patients, the gallbladder is usually hydropic and tense, and the tissue is fragile and tends to bleed. Hence, dissection must be very careful. Some studies have proposed emptying the bladder to ease dissection in such cases [9]. Early LC is generally advised within 72 h. However, some studies have suggested that up to 96 h is acceptable [10-12].

At our clinic, patients presenting with AC within 72 h are treated via LC. Those who do not respond to medical treatment and have been scheduled for surgery are routinely treated with LC unless an indication for open surgery is present. Five of the 12 patients who underwent LC required conversion to open surgery.

Of patients presenting with AC who arrived at our clinic within 72 h and who underwent laparoscopic surgery, 32 (10.5%) required conversion to open surgery. On the other hand, 5 (41.6%) of the 12 patients who underwent LC after 72 h and who did not respond to medical treatment were converted to open surgery. These data confirm literature reports to the effect that early LC used to treat acute cholecystitis decreases the incidence of conversion to open surgery, and suggests that LC should be performed within 72 h [10-12]. Many studies have reported high risks of conversion to open surgery associated with male gender, older age, leucocytosis, a high bilirubin level, large gallstones, and certain other factors [16-17]. In our series of cases that underwent conversion, 59.3% (n=19) were males and 40.6% (n=13) females. The type of gallbladder inflammation also plays an important role in conversion to open surgery. Confirming the report of Eldar et al., conversion to open surgery was found to be very frequent in cases of gangrenous cholecystitis [18]. Other risk factors for conversion to open surgery include ultrasound findings of increased bladder wall thickness and pericholecystic collection [19]. A thick bladder wall renders dissection more difficult, and pericholecystic collection obscures the regional anatomy, hence increasing the rate of conversion. In our study, the mean gallbladder wall thickness in cases treated laparoscopically was 6.8 mm (range: 5-16 mm), and that in those converted to open surgery 10.9 mm (range: 5-20 mm). The conversion rate was significantly higher in patients with a wall thickness >1 cm ($P<0.05$).

It has been reported that no significant difference existed with respect to major bile duct injuries, bleeding, and intraabdominal organ injuries when laparoscopic and open cholecystectomy were used to treat acute cholecystitis cases [20]. It has also been reported that, in AC cases, incision site infection rates are lower after laparoscopic than open surgery. However, this difference was not found to be significant in cases of chronic cholecystitis [21, 23]. Six of our cases treated laparoscopically developed infections at the incision sites. In all of these cases, the infections occurred at the same trocar entrance site, suggesting that infection was attributable to direct contact with cholecystectomy materials during the removal thereof. Thus, particularly for AC cases, it is proposed that such materials should be placed in a protective sac and removed with the sac. Four converted cases developed incision site infections.

One of the most significant disadvantages of LC used to treat acute cholecystitis is the long duration of surgery. However, with increasing experience, this disadvantage may be resolved [20, 22]. Considering the surgical process only: In AC patients, LC is more expensive (by about 30-40%). However, the shorter length of hospital stay, the decreased need for analgesics and antibiotics, and an earlier return to work, render the laparoscopic approach more economically reasonable [9, 23, 24]. In the present study, the mean length of hospital stay for those who underwent laparoscopic surgery was

2 days, and 3 days for those who underwent open surgery.

Conclusion

In summary, the optimal treatment for acute cholecystitis in patients admitted to hospital >72 h after symptom onset remains controversial. We found that the risk of conversion to open surgery from the laparoscopic approach, and complication rates, increased with male gender, gallbladder wall thickness ≥1 cm, the presence of abundant pericholecystic collections, the presence of the gangrenous type of inflammation (gangrenous cholecystitis), and when surgery was performed 72 h after the onset of AC symptoms of. LC is as safe as open cholecystectomy to treat AC.

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Disclosure of conflict of interest

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References

[1] Glenn F. Acute cholecystitis. Surg Gynecol Obstet 1976; 143: 56-60.

[2] Kum CK, Eypasch E, Lefering R, Paul A, Neugebauer E, Troidl H. Laparoscopic cholecystectomy for acute cholecystitis: is it really safe? World J Surg 1996; 20: 43-9.

[3] Sharp KW. Acute cholecystitis. Surg Clin North Am 1988; 68: 269-79.

[4] Teoh AY, Chong CN, Wong J, Lee KF, Chiu PW, Ng SS, Lai PB. Routine early laparoscopic cholecystectomy for acute cholecystitis after conclusion of a randomized controlled trial. Br J Surg 2007; 94: 1128-32.

[5] Suter M, Meyer A. A 10-year experience with the use of laparoscopic cholecystectomy for acute cholecystitis: is it safe? Surg Endosc 2001; 15: 1187-92.

[6] Lai PB, Kwong KH, Leung KL, Kwok SP, Chan AC, Chung SC, Lau WY. Randomized trial of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Br J Surg 1998; 85: 764-7.

[7] Lo CM, Liu CL, Fan ST, Lai EC, Wong J. Prospective randomized study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Ann Surg 1998; 227: 461-7.

[8] Prakash K, Jacob G, Lekha V, Venugopal A, Venugopal B, Ramesh H. Laparoscopic cholecystectomy in acute cholecystitis. Surg Endosc 2002; 16: 180-3.

[9] Glavic Z, Begic L, Simlesa D, Rukavina A. Treatment of acute cholecystitis. A comparison of open vs laparoscopic cholecystectomy. Surg Endosc 2001; 15: 398-401.

[10] Karvonen J, Gullichsen R, Laine S, Salminen P, Grönroos JM. Bile duct injuries during laparoscopic cholecystectomy: primary and long-term results from a single institution. Surg Endosc 2007; 21: 1069-73.

[11] Pessaux P, Tuech JJ, Rouge C, Duplessis R, Cervi C, Arnaud JP. Laparoscopic cholecystectomy in acute cholecystitis. A prospective comparative study in patients with acute vs. chronic cholecystitis. Surg Endosc 2000; 14: 358-61.

[12] de Mestral C, Rotstein OD, Laupacis A, Hoch JS, Zagorski B, Alali AS, Nathens AB. Comparative operative outcomes of early and delayed cholecystectomy for acute cholecystitis: a population-based propensity score analysis. Ann Surg 2014; 259: 10-5.

[13] Bhattacharya D, Senapati PS, Hurle R, Ammori BJ. Urgent versus interval laparoscopic cholecystectomy for acute cholecystitis: a comparative study. J Hepatobiliary Pancreat Surg 2002; 9: 538-42.

[14] Chandler CF, Lane JS, Ferguson P, Thompson JE, Ashley SW. Prospective evaluation of early versus delayed laparoscopic cholecystectomy for treatment of acute cholecystitis. Am Surg 2000; 66: 896-900.

[15] Knight JS, Mercer SJ, Somers SS, Walters AM, Sadek SA, Toh SK. Timing of urgent laparoscopic cholecystectomy does not influence conversion rate. Br J Surg 2004; 91: 601-4.

[16] Onishi H, Tani M, Kinoshita H, Ueno M, Yamaue H. Timing of laparoscopic cholecystectomy for acute cholecystitis with cholecystolithiasis. Hepatogastroenterology 2004; 51: 346-8.

[17] Lo CM, Fan ST, Liu CL, Lai EC, Wong J. Early decision for conversion of laparoscopic to open cholecystectomy for treatment of acute cholecystitis. Am J Surg 1997; 173: 513-7.

[18] Eldar S, Sabo E, Nash E, Abrahamson J, Matter I. Laparoscopic cholecystectomy for the various types of gallbladder inflammation: a prospective trial. Surg Laparosc Endosc 1998; 8: 200-7.

[19] Braghetto I, Csendes A, Debandi A, Korn O, Bastias J. Correlation among ultrasonographic and videoscopic findings of the gallbladder: surgical difficulties and reasons for conversion during laparoscopic surgery. Surg Laparosc Endosc 1997; 7: 310-5.

[20] Unger SW, Rosenbaum G, Unger HM, Edelman DS. A comparison of laparoscopic and open treatment of acute cholecystitis. Surg Endosc 1993; 7: 408-11.

[21] Deziel DJ, Millikan KW, Economou SG, Doolas A, Ko ST, Airan MC. Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. Am J Surg 1993; 165: 9-14.

[22] Tekin A, Küçükkartallar T, Belviranlı M, Vatansev C, Aksoy F, Tekin Ş, Kartal A. Early laparoscopic cholecystectomy for acute cholecystitis. Ulus Travma Acil Cerrahi Derg 2009; 15: 62-66.

[23] Michailidou M, Kulvatunyou N, Friese RS, Gries L, Green DJ, Joseph B, O'Keeffe T, Tang AL, Vercruysse G, Rhee P. Time and cost analysis of gallbladder surgery under the acute care surgery model. J Trauma Acute Care Surg 2014; 76: 710-4.

[24] Wang CH, Chou HC, Liu KL, Lien WC, Wang HP, Wu YM. Long-term outcome of patients with acute cholecystitis receiving antibiotic treatment: a retrospective cohort study. World J Surg 2014; 38: 347-54.