

**Original Article****FEASIBILITY OF LAPAROSCOPIC CHOLECYSTECTOMY IN ACUTE CHOLECYSTITIS**

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**ABSTRACT**

**Background:** Gallstone disease is a global health problem. The incidence is 10–20% of the whole adult population. The most common infectious disease of the Gallbladder (GB) is the acute cholecystitis (AC).

**Objectives:** evaluate the safe technique of surgery in patients with acute cholecystitis, to highlight the better method in which patient can be prevented from complications, to analyze the clinical features and surgical outcome of LC for AC, to develop a new criterion for the therapeutic strategy used for AC, especially for late AC. **Patients & Methods:** The present study shows that the operation time among the studied cases ranged from 90 to 120 min with mean 105.34 min. Out of 24 LC cases 5 patients (20.8%) were converted to open cholecystectomy. These patients had unclear anatomy during LC dissection, wherein 3 patients (12.5%) had bile duct injury and 2 patients (8.3%) had bleeding. **Results:** Observed that the mean total hospital stays as a result of repeated readmission and recurrent attacks biliary pain were higher for patient groups with significant distribution. Therefore, the overall patient's satisfaction regarding surgical outcome, recurrent attacks biliary pain, repeated readmission, and the length of hospital stay was in favor of patients with early surgical intervention. Our results concerning patient's preference and satisfaction came in concordance with other published results of the same interest. **Conclusions:** The conversion rate is related to operators' surgical experience. Regarding the postoperative outcomes, financial costs and length of hospital stay, it is more helpful than LC beyond 72 hours.

**Keywords:** Gallstone, LC, Postoperative outcomes

**INTRODUCTION**

**C**holeolithiasis is present in approximately 10–15% of the adult population with approximately 20% of these patients experiencing some form of symptoms. Of those experiencing symptoms, 1–3% will eventually progress to acute cholecystitis (AC)<sup>[1]</sup>.

Laparoscopic surgery is no longer considered to be a contraindication for AC, and has become the procedure of choice due

to decreased morbidity compared with conventional open surgery. However, the appropriate management of AC in critically ill or elderly patients with underlying medical conditions still remains a controversial issue, because high postoperative morbidity and mortality rates were reported in these patients after emergency cholecystectomy<sup>[2]</sup>. According to the updated Tokyo Guidelines 2013 (TG13), the optimal treatment for AC is

early laparoscopic cholecystectomy (LC), particularly when less than 72 hours have passed since the onset of symptoms [3].

Because the operative difficulty of LC for late AC is greater, elective surgery has been recommended after several weeks or more; alternatively, careful LC may be performed by an expert team [4].

AC encompasses a range of potential operative conditions. The ability to pre-operatively identify factors that predict difficult operative conditions and portend increased risk for postoperative complications would be of great use to surgeons in planning the initial treatment approach and timing of operation [1].

With LC for AC, the postoperative hospital stay was significantly shorter than that with the open approach. The rates of postoperative herniation and wound infections related to emergency surgery can be decreased by employing laparoscopy, and the cosmetic results would doubtlessly be improved. For these reasons, LC can be beneficial for AC patients as long as it is successfully done [5].

The feasibility of the laparoscopic technique in the condition of AC was assessed and reported in a number of publications. It has been shown that laparoscopy for AC was feasible, with conversion rates ranging from 0.5% to 28%. The conversion rate with LC for AC was evidently greater than that for elective cases. In AC, extensive inflammation, adhesions, and consequent increased oozing would make dissection of Calot's triangle and recognition of the biliary anatomy more hazardous and difficult [6], [7].

When performed by an experienced laparoscopic surgeon, LC for AC would be feasible, and as safe as an open cholecystectomy, with significant benefits to the patient. Early cholecystectomy, within 4 days of the onset of acute symptoms, was strongly recommended to minimize surgical

complications and to increase the chance of a successful laparoscopic approach [5]. Aim of the work the rational of this study was to evaluate the role of LC in cases of AC.

## PATIENTS AND METHODS

This retrospective analysis study included 24 consecutive patients, out of them, 17 (70.8%) were females and 7 (29.2%) were males, who presented with acute cholecystitis (AC) and underwent laparoscopic cholecystectomy (LC). Patients operated at General Surgery Departments, Faculty of Medicine, Zagazig University Hospital, during the period from Jan 2018 to December 2018.

**Surgical procedure:** Laparoscopic cholecystectomy (LC) was performed as soon as possible after admission. After induction of anesthesia vs needle technique was performed in all cases. During this study period, five consultant surgeons with vast experience in the field of laparoscopy performed LC.

**Operative strategy:** The patient was placed in the supine position on the operating table with both lower extremities apposed.

### Laparoscopic Cholecystectomy (LC) equipments including:

- Two laparoscopic monitors
- One laparoscope (5/10 mm, 0/30 degrees) including camera cord and light source
- Carbon dioxide source and tubing for insufflation
- 5 mm to 12 mm trocars (average three 5 mm working trocars and one 10 mm to 12 mm trocar)
- Laparoscopic instruments: Atraumatic graspers, Maryland grasper, clip applier, electrocautery (e.g., hook, spatula), and a retrieval bag
- Scalpel (11/15 blade), forceps, needle driver, and absorbable sutures
- Major open tray, for possible conversion

**Preparation:** The patient medically optimized preoperatively. Preoperative antibiotics such as ceftriaxone or ceflexin

1gram should be given within 30 minutes of incision per protocol. An aseptic surgical field is created from just above the bilateral costal margins to the pubic tubercle and laterally to the right and left flanks. The sterile surgical field allow for the possibility of an open procedure if needed.

#### **Surgical Procedure:**

LC was performed as soon as possible after confirmation of AC. Perioperative intravenous antibiotic therapy was administered to all patients. Residents usually performed LC with a senior doctor who had more than 10 years of surgical experience. After induction of anesthesia and intubation, the LC may begin.

First, insufflation of the abdomen by veress needle is achieved to 12-15 mmHg using carbon dioxide. The standard four-trocar operative technique was used for LC. Because the gallbladder was usually distended, it was first aspirated and decompressed. To create a critical view of safety, Calot's triangle was dissected of fat and fibrous tissue and the lower end of the gallbladder was dissected off the liver bed.

#### **Informed consent:**

Informed consent has been obtained from all individuals included in this Study

#### **Ethical approval:**

The research related to human use has been complied with all the relevant national regulations, institutional policies and in accordance to the ethical guidelines of Zagazig University, and has been approved by the authors institutional review board (IRB). The work was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

#### **RESULTS**

Table (1) showed demographic and clinical characteristics of the AC patients who underwent early cholecystectomy

A total of 24 patients underwent LC during this study period; out of them, 17 (70.8%) were females and 7 (29.2%) males (female/male ratio of 3.6:1). The mean age of the patients was  $46.82 \pm 8.73$  (range, 20–60 years). Regarding the mean pain duration was  $3.92 \pm 1.63$  (range, 1-3) days.

Table (2) showed physical examination findings of the AC patients who underwent early cholecystectomy

Preoperatively, the physical examination findings were clearly mentioned at admission. Tenderness had been found in the abdominal examination of AC patients. Total 9 (37.5%) of patients have palpable tender mass, and total 20 (83.3%) of them have Murphy symptom.

Table (3) showed the preoperative laboratory findings among the studied cases: Initial preoperative serum CRP(C-reactive protein) were found  $\geq 10$  mg/dl in total 6 (33.3%) of patients, while total 4 (16.7%) patients have WBC count  $\geq 18 \times 10^3/\text{mm}^3$ .

Table (4) showed knowledge of gall stone among the studied cases

This table shows that 18 (75%) patients know that they have gall stone, and 6 (25%) of them don't know they had gall stone.

Operation data among the studied cases:

The operation time among the studied cases ranged from 90 to 120 min with mean 105.34 min. Out of 24 LC cases 5 patients (20.8%) were converted to open cholecystectomy. These patients had unclear anatomy during LC dissection, wherein 2 patients (8.3%) had bleeding and 3 patients (12.5%) had bile duct injury.

Hospital stay among the studied cases:

The hospital stay among the studied cases ranged from 1 to 3 day with mean 2.67 days.

**Table 1** Demographic and clinical characteristics of the AC patients who underwent early cholecystectomy

Variable	(n=24)
<b>Age : (year)</b>	
Mean ± SD	46.82 ± 8.73
Range	20 - 60
<b>Gender (No, %)</b>	
Male	7 (29.2%)
Female	17 (70.8%)
<b>Mean pain duration (days)</b>	
Mean ± SD	3.92 ± 1.63
Range	1 – 3

**Table 2** Physical examination findings of the AC patients who underwent early cholecystectomy

Physical exam findings (No., %)	(n=24)	
	No.	%
<b>Palpable tender mass</b>	9	37.5%
<b>Murphy's sign (+)</b>	20	83.3%

**Table 3** The preoperative laboratory findings among the studied cases

Variable	(n=24)	
	N	%
<b>CRP: (mg/dl)</b>		
< 10 mg/dl	18	66.7
≥10 mg/dl	6	33.3
<b>WBCs: (<math>\times 10^3/\text{mm}^3</math>)</b>	20	83.3
< $18 \times 10^3/\text{mm}^3$		
≥ $18 \times 10^3/\text{mm}^3$	4	16.7

**Table 4** Knowledge of gall stone among the studied cases

Variable	(n=24)	
	No	%
<b>Gall stone:</b>		
<i>Don't know</i>	6	25
<i>Know</i>	18	75

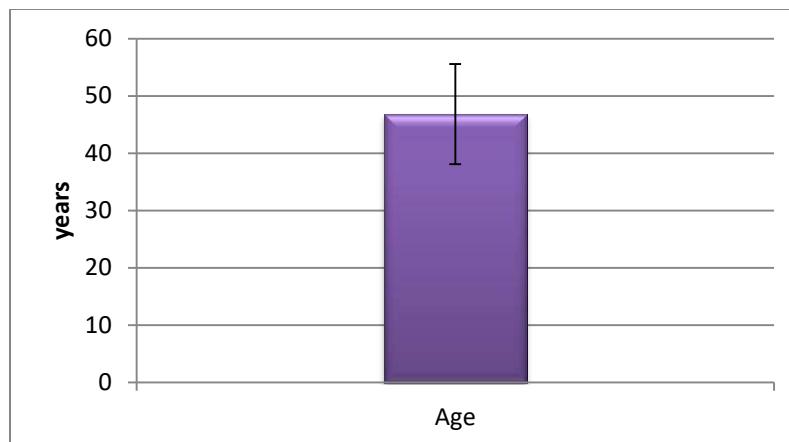


Figure (1): Age of the studied cases.

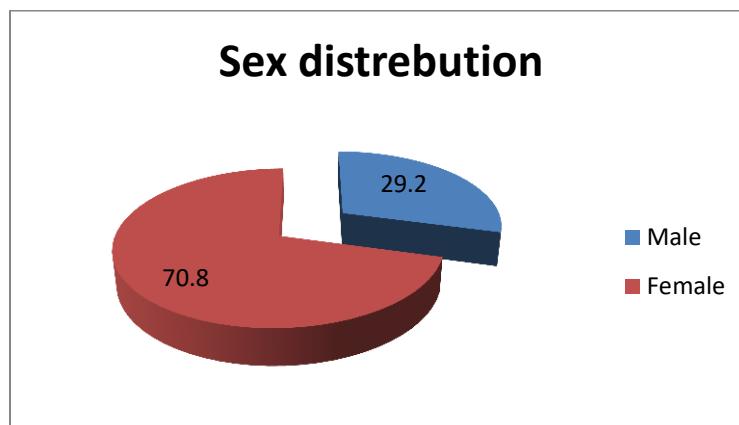


Figure (2): Sex distribution of the studied cases.

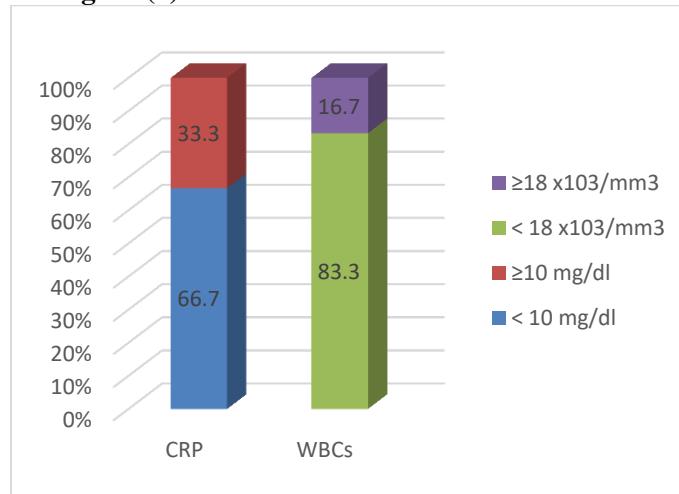


Figure (3): CRP &amp; WBCs among the studied cases.

## DISCUSSION

Gallstone disease is a global health problem. The incidence is 10–20% of the whole adult population. The most common infectious disease of the Gallbladder (GB)

is the acute cholecystitis (AC). AC is a common cause of abdominal pain and unless treated promptly, patients may develop complications such as gangrenous, perforated, or emphysematous cholecystitis.

Because of the increased morbidity and mortality of complicated cholecystitis, early diagnosis and treatment are essential for optimal patient care<sup>[8]</sup>.

Early cholecystectomy is the optimal treatment for AC using established optimal surgical treatment for each grade of severity. Several studies have shown that early LC conducted within 72–96 hours after the onset of symptoms is usually associated with advantages such as reduced hospital stay, sick leave, and health care expenditures and no disadvantages with regard to mortality and morbidity<sup>[3]</sup>.

Early diagnosis and treatment of patients with AC reduce both mortality and morbidity and the accurate diagnosis requires specific diagnostic criteria of clinical data and imaging studies<sup>[9]</sup>. The typical ultrasound image of AC demonstrates gallbladder swelling, wall thickening with sonolucent layers, massive debris, and the stone impaction in the cystic duct<sup>[10]</sup>.

LC has now replaced open cholecystectomy as the first choice of treatment for gallstones, LC is performed in over 90% of elective cholecystectomies and 70% of emergency cholecystectomies making LC one of the most frequently performed operations in the world<sup>[11]</sup>.

The present study aimed to evaluate the role of LC and the safe technique of surgery in patients diagnosed with AC. Our study also highlights the better method in which patient can be prevented from complications. To our knowledge, the study analyzed the clinical features and surgical outcome of LC for AC patients and develops a new criterion for the therapeutic strategy used for AC, especially for late AC.

A total of 24 patients underwent LC during this study period; out of them, 17 (70.8%) were females and 7 (29.2%) males. In our study female to male ratio

was 3.6:1 which in accordance to **Francesco et al**<sup>[12]</sup> showing increased incidence of calculous disease in females. In contrast, **Kapoor et al**<sup>[13]</sup> study showed the ratio of females to males who underwent LC for gall stones was found to be 2.8:1.

Additionally, the mean age of our patients was  $46.82 \pm 8.73$  (range, 20–60 years). Regarding the mean pain duration of our patients was  $3.92 \pm 1.63$  (range, 1–3) days. It is in accord with **Kapoor et al**<sup>[13]</sup> who reported the mean age of their patients was 44.5 years and more than 80% of patients were above 30 years and range of 15–80 years, and 50% of patients presented with right hypochondrium.

Preoperatively, the present study found the physical examination findings were clearly mentioned at admission. Tenderness had been found in the abdominal examination of AC patients and total 9 (37.5%) of patients have palpable tender mass, and total 20 (83.3%) of them have Murphy sign. The physical examination findings were similar in the study of **Acar et al**<sup>[14]</sup> who found tenderness had been found in the abdominal examinations of all their patients, and 25% of patients have palpable hydropic gallbladder. They reported also the classical Murphy symptom, which is characterized by the abrupt arrest of breathing when a direct palpation is applied onto the gallbladder. However, **Saber and Hokkam**<sup>[15]</sup> demonstrated the clinical and physical data included pain in the right upper quadrant with tenderness and may be accompanied by palpable mass according to the severity of the disease.

Laboratory tests were C-reactive protein (CRP) and white blood cells (WBC). In the present study, initial preoperative serum CRP were found  $\geq 10$  mg/dl in 33.3% of patients, while 16.7% patients have WBC count  $\geq 18 \times 10^3/\text{mm}^3$ .

These parameters of laboratory investigations were in agreement with other studies of the same interest [9], [16], [17].

According to Tokyo guidelines, CRP, a well-known acute phase reactant that increases rapidly in inflammatory processes, is included in the laboratory findings for the diagnosis of AC. In various studies, CRP has been found to be a strong predictive factor in determining the severity of gallbladder inflammation [18]. In patients of AC with high levels of CRP, conversion from laparoscopic to open procedure was found to be at higher rates [19]. However, unlike WBC count that has taken place in grading the disease according to the guideline, the predictive value of CRP has not been determined and accepted among prognostic factors yet [20].

In general, levels of CRP of up to 10 mg/L are considered clinically insignificant for acute inflammatory reactions. On the other hand, CRP levels of 100 mg/L or more are strongly associated with local tissue necrosis [21], [22]. In a study that observed CRP levels in the diagnosis of sepsis, the threshold value was considered to be  $> 100$  mg/L, but no cut-off value was defined [23].

The present study shows 18 (75%) patients know that they have gall stone, and 6 (25%) of them don't know they had gall stone. Ultrasound finding of AC in our patients was enlarged gallbladder with long axis measured 9 cm and wall thickness measured 8 mm with trilaminar characteristic. The presence of pericystic fluid indicated more advanced disease. These parameters of grading were in agreement with other studies of the same interest [9], [16], [17].

Ultrasonography is highly important in the diagnosis. Presence of gallstones or gallbladder sludge, gallbladder wall thickening of 4 mm or above, and detection of pericholecystic fluid support the

diagnosis of AC. The Tokyo criteria were defined for the diagnosis and determination of the severity of the disease [9].

The present study shows that the operation time among the studied cases ranged from 90 to 120 min with mean 105.34 min. Out of 24 LC cases 5 patients (20.8%) were converted to open cholecystectomy. These patients had unclear anatomy during LC dissection, wherein 3 patients (12.5%) had bile duct injury and 2 patients (8.3%) had bleeding.

Surgical interference in early LC patients was performed within 72 hours of occurrence of symptoms in the present study that came in concordance with other studies [24], [25], [26]. Early LC within 5 days of onset of symptoms in acute phase has proved superior to open cholecystectomy [27] and early LC within 4 days of onset of symptoms has been shown to reduce a number of complications and conversion rate while LC performed within 24 hours resulted in more satisfactory outcome [2].

There is no doubt that the reduction of operative times and amounts of blood loss would participate in patient safety and improves the overall outcomes. It is goes in accordant with the study of **Ambe et al.** [28] who could not prove any difference in outcome between the group managed within 24 hours and that managed 25 - 72 hours of onset of symptoms. Their results therefore suggest that it is not necessary to perform LC for AC within 24 hours following symptom onset. In this series, authors' aken together, a division of the critical time frame, i.e. the so called "golden 72 hours" for the surgical management of acute cholecystitis into a more favorable "golden 24 hours" and a less favorable "silver 25-72 hours" could not be justified in this series.

Previously, in series of **Soomro et al.** [2] was noted from their series that, the mean

operating time duration was 84.3 minutes (range, 30-255 minutes) and the mean postoperative stay hospital was 5.8 days (range, 1-35 days).

**Shinke et al.** [29] in their retrospective study analyzed a group of 233 patients with acute cholecystitis subjected to emergency LC within 7 days of the onset of symptoms. They were divided into a group operated on within 72 hours of the onset of symptoms (early phase group), and a group of patients who underwent surgery between day 4 and day 7 after the onset of symptoms (late phase group).

The definition of a difficult cholecystectomy is relative, and it is linked to the experience of the surgical team [30], [31]. Experience with only basic laparoscopy leads to excessive exclusion from the laparoscopic approach and high conversion rates, approaching 10%. Advanced laparoscopic experience leads to only rare planned open cholecystectomy and very low conversion rates [12].

Complications of LC include early and late complications [32]. Early complications include complications due to port entry, bowel injuries, and bleeding and biliary complications include spilled gallstones, and bile duct injuries. The complications can be minimized with careful patient selection, meticulous operative dissection, and judicious use of cholangiography along with sound surgical judgment [33], [32].

The present study showed overall complication rate was 20.8% of patients. Total 3 (12.5%) cases had bile duct injury and total 2 (8.3%) cases had bleeding. Regarding, the present study showed 1 (4.2%) mortality due to anesthetic reasons of the all cases admitted to ICU. On the other hand, among 83.3% of patients creation of critical view of safety had been achieved.

Our LC observed that operative bleeding, conversion to open technique, and

spillage of stones due to gallbladder perforation were the operative complications encountered in this study with similar incidence rates as previously reported [34], [35], [32].

In our study, minor bile duct injuries managed by conversion to open, repair with T tube insertion and intraoperative cholangiogram done.

Recently, a study of **Kim et al** [33] showed only an 8% rate of infectious complications. On the contrary, adequate source control at the correct time might be the most important factor for management of mild AC. Source control is composed of elimination of the inflammatory pathogen and repair of damaged anatomical structures using surgical procedures such as LC.

In another prospective study, **Wacha et al.** [34] revealed that inadequate source control at the time of the operation increases the mortality risk in cases of intraabdominal infections. **Kim et al** [33] believe that effective source control such as cholecystectomy at the appropriate time would be much more beneficial to infection prevention than postoperative antibiotic prophylaxis.

LC is the procedure of choice in symptomatic cholelithiasis, since it is advantageous because of less hospital stay, limited pain, better cosmesis and less operative time [13].

Our results of the present study shows the hospital stay among the studied patients ranged from 1 to 3 day with mean 2.67 days. This result as agreement with previously reported [13]. However, **Taki-Eldin and Badawy** [35] reported the mean hospital stay was (2.6±1.5 days) (ranged 1-11).

An interesting work performed at King Hussein Medical Center, Jordan, comparing the early and delayed approaches in management of AC stated that the early approach had the advantage

of offering the patients a definitive treatment during the index admission while reducing the overall total hospital stay and avoiding the problems of failure of delayed therapy. This may translate into an economic benefit and better patient satisfaction when compared with delayed therapy<sup>[36]</sup>.

Regarding the operative and postoperative complications in the study patients, the difference concerning patient's satisfaction for surgical outcome was statistically insignificant. Our results observed that the mean total hospital stays as a result of repeated readmission and recurrent attacks biliary pain were higher for patient groups with significant distribution. Therefore, the overall patient's satisfaction regarding surgical outcome, recurrent attacks biliary pain, repeated readmission, and the length of hospital stay was in favor of patients with early surgical intervention<sup>[37]</sup>. Our results concerning patient's preference and satisfaction came in concordance with other published results of the same interest<sup>[37], [36], [38]</sup>.

**Indar and Beckingham** <sup>[39]</sup> showed that early LC for AC is a safe and feasible therapeutic modality, especially if performed within 72 hours of the onset of symptoms. The updated 2013 Tokyo guidelines to recommend early laparoscopic cholecystectomy within 72 hours of the onset of symptoms<sup>[40]</sup>.

### CONCLUSION

Certain factors are responsible for the conversion, which include delayed arrival of patient, patients with perforated gall bladder, bleeding and adhesions. Hence, emergency LC seems to be safe, cost effective, and timely surgery with modern conception. This timely surgery prevents the complications associated with AC. LC for AC must not be performed within 24 hours of admission. The golden 72 hours time frame however should be maintained where possible

### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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None declared

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