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Original Article

Early versus Delayed Laparoscopic Cholecystectomy for Treatment of Acute Calcular Cholecystitis

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ABSTRACT

Background: Acute calcular cholecystitis is a common disease. Conservative treatment was the standard treatment option till the advancement of laparoscopic surgery (LC). The surgery becomes the gold standard. However, the timing of surgery is still debatable. The current work aimed to compare between early and delayed LC regarding safety and efficacy profile.

Methodology: We retrospectively evaluated the data of 120 patients (60 in each group), who were presented with acute calcular cholecystitis. Their demographic characteristics, clinical manifestations, results of ultrasound and laboratory investigations were documented. In addition, operative data and postoperative complications were compared between groups.

Results: Both early and delayed LC groups were comparable regarding patient demographics, preoperative associated medical diseases, and postoperative complications. On the other side, the conversion rate to open surgery was significantly higher in the early than the delayed groups (21.7% vs 8.3%), and operative time was significantly longer in early than delayed groups. The difficulty in gall bladder handling was significantly higher in the early than the delayed group (21% vs 15.0%). However, the duration of hospital stay was significantly shorter in the early than the delayed group (4.12±1.04 vs 9.81±1.68 days, respectively).

Conclusion: Early laparoscopic cholecystectomy is advocated over the delayed approach, as it is associated with shorter hospital stay, with comparable safety and efficacy profile to the delayed laparoscopic cholecystectomy.

Keywords: Gall bladder; Cholelithiasis; Laparoscopy; Cholecystectomy; Timing.

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INTRODUCTION

Acute calcular cholecystitis (ACC) is a common biliary tract disease. It is responsible for ~ 20 % of hospital admissions. It is more common in females than males (3:1) in patients younger than 50 years of age. After that age, the percentage changed to (2:1 female to male). Gallstones are very common in patients with acute cholecystitis (AC) (about 95% of AC had gall stones) [1]. Laparoscopic cholecystectomy (LC) has become the "gold standard" for the treatment of symptomatic gallbladder stones [2]. LC is greatly affected by acute inflammation and the surgical procedure represents a surgical challenge. This is attributed to inflammatory changes (e.g., edema, exudate, adhesions of structures, friable tissues, gallbladder distension, distorted anatomy, and risk of dissemination of infection). These factors predispose to a dissatisfied outcome and high rate of conversion to open surgery [3]. In calcular acute cholecystitis, the appropriate timing of surgery remains controversial [4,5]. Two timing approaches are present: early (within 7 days of the onset of symptoms). The second is the delayed approach after failure of conservative treatment (6-12 weeks after the onset of acute calcular cholecystitis) [3,6]. Early open cholecystectomy is the preferred treatment of acute calcular cholecystitis. It helps to decrease morbidity, mortality, total hospital stay and healthcare costs. However, the introduction of LC leads to reduction of the benefits of early open surgery. On the other side, delayed surgery had the potential increase of further gallstone-related complications during the waiting time and needs additional admission with increased healthcare cost [7-9].

One study has indicated that early LC is a safe option in acute calcular cholecystitis regardless of the higher rate of conversion to open cholecystectomy (5-35%) [10]. In addition, other complications were reported including prolonged operative time. Thus, delayed or elective LC after conservative treatment became an accepted alternative [11]. However, there is a still need to evaluate early versus delayed LC in treatment of acute calcular cholecystitis. The current work was designed to compare retrospectively early and delayed LC for treatment of acute calcular cholecystitis.

PATIENTS AND METHODS

The present study is a retrospective comparative study. It included patients who underwent early or delayed LC between January 2018 to December 2019. The study included 120 patients with confirmed diagnosis of acute calcular cholecystitis. They were selected from Damietta General Hospital (Damietta, Egypt). Patients were grouped into one of equal two groups (each 60 patients). Group I, for LC in the first 7 days from the onset of symptoms (early); Group II for delayed LC where patients underwent conservative treatment till improvement then an elective LC was performed. Patients who were deteriorated were excluded from the study. The diagnosis of ACC was built on clinical and radiological findings. The clinical manifestations included right hypochondrial pain persistence for > 24 hours, right hypochondrial tenderness, fever, and leukocytosis. The ultrasound evidence include presences of gall stones (single or multiple), thickened gallbladder wall, pericholecystic collection and distended bladder [12].

For inclusion in the study, only adult patients (older than 18 years), who had confirmed diagnosis of ACC (ultrasound evidence plus one or more of clinical or laboratory evidence of ACC) (e.g., Abdominal pain of the right hypochondrium, Positive Murphy's sign, leukocytosis, and fever). In addition, to signing an informed consent and fitted for general anesthesia.

On the other side, patient was excluded if he/she had any contraindications to laparoscopy (e.g., cardiac disease or bad chest condition), peritonitis, previous upper abdominal surgery, gall bladder abscess or perforation, pregnancy, breastfeeding, end-stage liver disease, patient refusal, diabetes, or autoimmune diseases, and patients under the age of 18 years. In addition, patients do not respond to conservative management in group-II as described earlier.

The clinical assessment included history taking, general and & local abdominal examination. In addition, all preoperative laboratory investigations (e.g., complete blood count, prothrombin time, INR, liver enzymes, total and direct bilirubin, alkaline phosphatase, albumin. Serum urea, creatinine, sodium, and potassium). Furthermore, all patients had pre-operative pelviabdominal ultrasound commenting on the gall bladder wall thickness, the number of the stones, their size and site and presence of pericholecystic fluid collection along with other intra-abdominal and pelvic organs pathology. On admission, there was nothing per mouth, that continued in the early group (I) till the time of operation. But, in the second group (II), it continued till the patient tolerate oral feeding and clinical improvement (no fever, tachycardia or leukocytosis). All received intravenous fluids, broad spectrum third generation cephalosporins (1 gm every 12 hours up to 5 days, extended if indicated). All patients in both groups received narcotic analgesic in the form of Pethidine 50mg every 12 hours with antispasmodic injection for 24 hours then sodium diclofenac 75 mg was given when needed. Nasogastric tube (NGT) has been used for patients who were complaining of vomiting.

Operative Details: General anaesthesia was used for all patients, and all were intubated with a cuffed endotracheal tube and mechanically ventilated. The standard technique for laparoscopic cholecystectomy was used, with the patients were placed in the standard supine position, while the surgeon and camera man standing at the patient's left, the second assistant on the right and the monitor at the shoulder level of the patient. The patient was generally placed in a reverse Trendelenburg position and rotated right side up. Insertion of the umbilical port using open Hasson technique and CO_2 insufflation for creation of pneumoperitoneum was done. The laparoscope was placed at the umbilicus to perform diagnostic laparoscopy. Then the other three ports were inserted under vision. Dissection of adhesions that may be present between the omentum and the gall bladder and the liver and anterior abdominal wall (Figure 1). The distended gall bladder was aspirated first via aspiration needle and the fundus was raised with 5 mm forceps. To dissect the cystic pedicle, the anterior and posterior peritoneum overlying Calot's triangle was incised, usually with the Lshaped hook with creation of windows between the cystic artery and duct (figure 2). The cystic artery and duct were clipped after obtaining the critical view of safety (Figures 3,4).

Mass division or clipping of any large clump of tissue or duct structure was avoided. Electrocautery dissection of the gallbladder completed the cholecystectomy. The dissection was started behind Hartmann's pouch (Figure 5). Gentle traction was applied to the gallbladder moving it from side to side so that the loose areolar tissue can be demonstrated (Figure 6).

The gallbladder was extracted through the epigastric port (Figures 7, 8). Fascial closure was attempted only at the umbilical cannula site. During extraction of the distended gall bladder widening of the epigastric port could be done to facilitate its extraction and to avoid spillage of its contents. In cases where achievement of the critical view of safety was difficult due to dense adhesions in calot's triangle, top-down technique was employed. In top-down technique we started the dissection of fundus of the gall bladder down to the cystic pedicle (figure 9). It is well recognized as a safe technique to minimizes the risk of injuries to the biliary structures and to reduce the conversion rate to open cholecystectomy. In this study, when conversion to open cholecystectomy was necessary (due to difficult dissection at Calot's triangle) a right subcostal incision was performed, the area was isolated with packs, the neck of the gallbladder was grasped with sponge holding forceps, the cystic artery was divided between ligatures, The cystic duct was then ligated and divided, the gallbladder was dissected from its liver bed, then was removed, hemostasis assured and the abdominal wall was closed in layers.

Outcome and postoperative follow-up: All patients received intra-venous fluids for only 12 hours followed by oral fluids and soft diet. All received intravenous third generation cephalosporin for 5 days (to be extended if indicated) postoperatively every 12hours. The patients were discharged after removal of the drain and when they were open bowel and tolerating oral intake. Follow up was done in outpatient clinic for one month postoperative. Abdominal ultrasound was done for selected cases. All patients were assessed for operative time, intraoperative difficulties according to Operative Grading System for Cholecystitis Severity (Easy cholecystectomy (<3) average difficulty (3-6), difficult (7-9), and very difficult (>9) [13]. In addition, intraoperative complications (e.g bleeding, injury to important structure as bowel, liver, and biliary ducts) and total duration of hospital admission were documented. The early postoperative complications include the conversion rate and postoperative pain.

Table (1): Comparison between groups regarding body weight and lipid profile

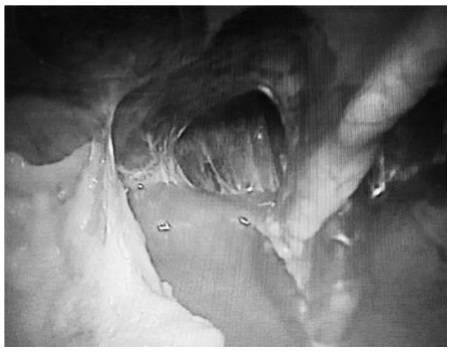

Figure (1): Adhesions was found between the liver and omentum and anterior abdominal wall.

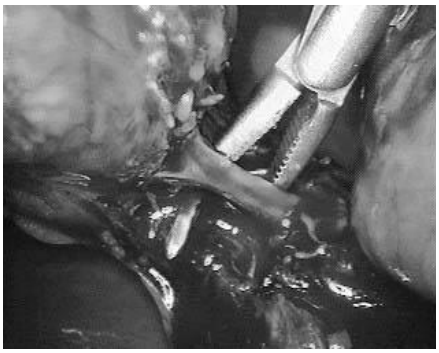

Figure (2): Dissection of cystic artery

Figure (3): Critical view of safety

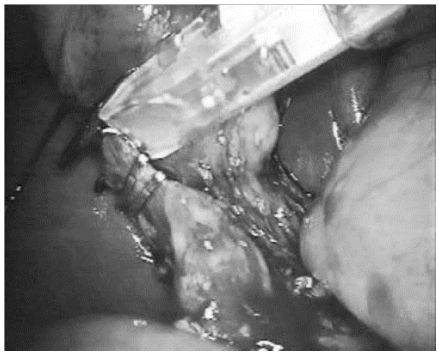

Figure (4): Clipping of cystic duct.

Figure (5): Hook electro-cautery used to dissect the gallbladder off the liver bed.

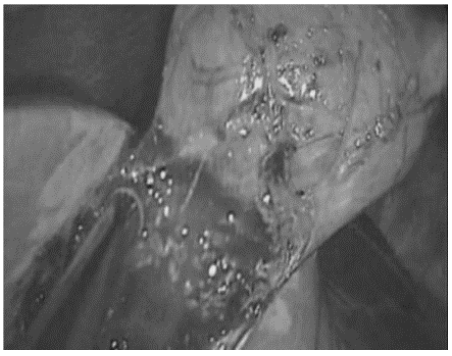

Figure (6): Removal of the gall bladder from its bed.

Figure (7): Clean liver bed with clipped cystic duct and cystic artery.

Figure (8): Extraction of the gallbladder

Figure (9): Fundus 1st technique

Statistical Analysis: Statistical analyses was performed using SPSS, version 16 (SPSS Inc., Chicago, USA). Categorical variables are described in frequency and relative percentages, while continuous variables are presented as mean and standard deviation (SD). Univariate analyses was conducted using a Student's t- or a Mann-Whitney (u)- test for continuous variables, and a Chi- square test or Fischer's exact test for categorical variables. A two-tailed P value $\leq$ 0.05 was considered significant from the statistical point of view.

RESULTS

The current work included 60 patients in each group (early and delayed groups). There were female sex predominance in both groups (66.7% vs 75.0 in early and delayed groups respectively). Age ranged between 28 and 65 years, while body mass index (BMI) ranged between 28.33 to 37.28 kg/m2); with no significant difference between groups. In addition, both groups were comparable regarding hypertension, history of acute attacks, duration of symptoms. But white blood cell count and ultrasound thick wall of gall bladder were significantly higher in the early than the delayed group (Table 1).

Regarding operative data, the conversion rate to open surgery was significantly higher in the early than the delayed groups (21.7% vs 8.3%, respectively), and operative time was significantly longer in early than delayed groups. The difficulty in gall bladder handling was significantly higher in the early than the delayed group (21% vs 15.0%). However, the duration of hospital stay was significantly shorter in the early than the delayed group (4.12±1.04 vs 9.81±1.68 days, respectively). Otherwise, there was no significant difference between groups regarding postoperative complications (Table 2).

Table (1): Demographic criteria of studied population

Variables		Group I (early, n= 60)	Group II (delayed, n= 60)	Total (n=120)	Statistics	
					Test	p
Sex (n,%)	Male	20 (33.3%)	15 (25.0%)	35 (29.2%)	1.01	0.42
	Female	40(66.7%)	45 (75.0%)	85 (70.8%)		
Age (years)	Mean±SD	47.48±6.57	48.05±7.62	47.77±7.09	0.43	0.66
	Min. – Max.	29-65	28-63	28-65		
BMI	Mean±SD	31.70±1.45	31.85±0.76	31.77±1.16	0.68	0.50
	Min. – Max.	28.33 – 37.28	30.09-34.79	28.33 – 37.28		
Hypertension (n,%)		19 (31.7%)	15 (25.0%)	34 (28.3%)	0.65	0.41
PH of acute attack		15 (25.0%)	10 (16.7%)	25 (20.8%)	1.26	0.26
Duration of acute symptoms (h)	Mean±SD	37.67±7.14	39.77±7.35	38.72±7.29	1.59	0.12
	Min.-Max.	20-52	22-52	20-52		
WBCs X 10 ^ 3	Mean±SD	12.49±2.06	11.48±2.13	11.98±2.15	2.63	0.010*
	Min.-Max.	8.24 – 17.50	6.80 – 18.90	6.80 – 18.90		
Ultrasound data (n,%)	Thick wall of GB	41(68.3%)	25(41.7%)	66 (55.0%)	8.62	0.003*
	Distended GB	14 (23.3%)	20 (33.3%)	34 (28.3%)	1.47	0.22
	Pericholecystic collection	9 (15.0%)	15 (25.0%)	24 (20.0%)	1.87	0.17

Table (2): Operative and postoperative data among study populations

Variables		Group I (early, n= 60)	Group II (delayed, n= 60)	Total (n=120)	Statistics	
					Test	p
Conversion to open surgery		13(21.7%)	5(8.3%)	18(15.0%)	4.18	0.041*
Operative time (min)	Mean±SD	103.83±25.85	91.60±22.24	97.71±24.79	2.78	0.006*
	Min.-Max.	69 – 167	70- 180	69-180		
Intraoperative data (n,%)	Difficult GB handling	21 (35.0%)	9 (15.0%)	30 (25.0%)	6.40	0.011*
	Bleeding	7(11.7%)	4 (6.7%)	11(9.2%)	0.90	0.34
Surgical technique	Calot's First	49(81.7%)	54(91.5%)	103(86.6%)	2.48	0.12
	Fundus First	11(18.3%)	5 (8.5%)	16 (13.4%)		
PO data (n,%)	Bile leak	1(1.7%)	1(1.7%)	2(1.7%)	0.001	1.00
	Jaundice	2(3.3%)	3(5.1%)	5(4.2%)	0.22	0.63
	Subhepatic collection	1(1.7%)	3(5.1%)	4 (3.4%)	1.07	0.30
	Superficial wound infection	1(1.7%)	3(5.1%)	4 (3.4%)	1.07	0.30
Duration of hospital stay (days)	Mean±SD	4.12±1.04	9.81±1.68	6.94±3.17	22.30	<0.001*
	Min.-Max.	2-6	8-15	2-15		

DISCUSSION

In the current work, we found that early LC for acute calcular cholecystitis is associated with higher white blood cell count, higher rate of conversion to open surgery, longer operative time, difficult gall bladder handling and shorter duration of hospital stay. Otherwise, both groups were comparable regarding patient characteristics, associated chronic medical disease, duration of acute symptoms, surgical technique, and postoperative complications.

In the early days of introduction of laparoscopic surgery, acute cholecystitis was one of the relative contraindications of surgery. But, with continuous advancement of laparoscopic tools (the endovision system and other surgical tools), it becomes a safe and feasible option [14]. However, previous studies documented a higher rate of conversion to open surgery in early LC (between 6 and 35%), as in the current work (21.7% in early LC versus 8.3% in delayed LC) [15, 16]. However, the time of LC is still debatable.

Falor *et al.* [17] compared early LC (within 48 hours of admission) (n= 117 patients) to delayed route (n = 186) in patients with gallstone pancreatitis. They reported that early LC was safe as delayed LC and associated with shorter duration of hospital stays. These results are in line with the current work.

Khalid *et al.* [18] reported a conversion rate of 15.5% in early and 14.4% for delayed LC. However, operative time was longer in early versus delayed LC (64.32 minutes vs. 58.24 minutes respectively). Irrespective of the different levels of conversion rate than the current work, our results agree with Khalid *et al.* regarding longer operative time in the early than the delayed LC.

In addition, our results agree with **Goh *et al.*** [19], who reported increased intraoperative severity and longer operative time (107 vs 95 minutes) in the early than the delayed LC. Conversion rate was also higher in the early when compared to delayed LC (21.4% vs. 4.9%, as in the current work.

The relatively longer operative time in the early LC group could be explained by time taken for dissection of adhesions and difficult handling of the gall bladder [20].

Our results are in accordance with **de Mestral *et al.*** [21] who reported a significantly short duration of hospital stay in early versus delayed LC. Additionally, **Pisano *et al.*** [22] observed similar results regarding the total duration of hospital stay.

Furthermore, **Kohga *et al.*** [23] reported shorter duration of hospital stay and consequently the cost in the early than the delayed LC with a similar rate of conversion to an open procedure. These results partially agree with the current one, regarding hospital stay but differ regarding conversion rate, where it was significantly higher in early than LC in the current study.

For postoperative complications, **Roulin *et al.*** [24] reported a lower rate of total postoperative morbidity in the early than delayed LC (14% vs 39%, respectively).

Also, **Jee *et al.*** [25] observed comparable data (7.78 vs 11.7%, respectively) regardless of the percentages. However, we did not find significant differences between early and delayed LC regarding postoperative morbidity.

In the current study, there was female sex predominance in both groups. These results agree with **Verma *et al.*** [20] who reported female to male ratio of 26:4 in the early and 14:1 in the delayed LC groups.

We used ultrasound as the main screening and diagnostic tool beside clinical manifestations. This agrees with **Hirota *et al.*** [26] who reported that ultrasound is the sensitive, non-invasive, readily available option for detection of gall bladder stones, wall thickening and pericholecystic collections.

Results of ultrasound findings in the current study is comparable to **Kolla *et al.*** [27] who reported that, findings in the early LC group included thickened gall bladder wall (60%) compared to 55% in delayed group. However, we found significant increase of thick wall of gallbladder in early than delayed group (68.3% versus 41.7%, respectively).

To sum up, the early LC could be advocated than delayed intervention. The main advantage is the shorter duration of hospital stay with the safety profile, nearly comparable to delayed LC. The difference in conversion rate and longer operative time could be improved over time, with an increasing learning curve. However, the current work had the limitation of retrospective nature of the study and small number of included patients, which mandates cautious handling of data. Future studies are warranted.

Conflict of interest: none.

Financial disclosure: none.

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