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Evaluation of Laparoscopic Cholecystectomy in the Treatment of Early Acute Cholecystitis

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Abstract

Acute cholecystitis is inflammation of gall bladder wall. Laparoscopic cholecystectomy has become the gold standard in the treatment of symptomatic gall stones. The aim of this work is to evaluate laparoscopic cholecystectomy in the treatment of early acute cholecystitis. Twenty patients were included in this study; this study is analytical prospective study; it was carried out on 20 patients presented with acute cholecystitis admitted in the general surgery department at AL-Zahraa University Hospital in the period from March 2021 to September 2021.All patients diagnosed as acute cholecystitis clinically followed by ultrasonography and laboratory data. Our study revealed that the mean age was (39.65 ± 11.31) and the range was(18-57), female patients were 11 (55%) and male patients were 9 (45%), Murphy sign was +ve in 16(80%), fever was in 15(75%),leukocytosis in 9 (45%) there was intraoperative dense fibrous adhesions in 2(10%) , fibrinous adhesions in 9 (45%) and omentum only in 7 (35%) , intraoperative phlegmon in the form of omentum and bowel in 2 (10%) and the form of pyocele in 2 (10%) . intra operative decompression in 3(15%), intra operative spillage of GB content in 4(20%), there was conversion to open in 2(10%) and this was due to severe adhesions, postoperative fever in 2(10%). postoperative pain was mild in 18(90%) and moderate in 2(10%). Early laparoscopic cholecystectomy is safe, effective and feasible. It had no increase in operative time, perioperative complication.

Keywords: Laparoscopic Cholecystectomy, Early Acute Cholecystitis.

1. Introduction

The Acute cholecystitis is inflammation of gall bladder, usually associated with cholelithiasis, with a high incidence in our environment. Laparoscopic cholecystectomy has been the procedure of choice for symptomatic gall bladder disease [1]. The incidence of gall stones is 10-15% and the lifetime recurrence rate of symptoms or complications in such patients is about 35% [2]. Acute cholecystitis is secondary to gallstones in 90-95% of cases. Mostly, an impacted gallstone in the gallbladder infundibulum or in the cystic duct is the cause for the inflammatory process. The continuing mucin production from the gallbladder's epithelium in combination with the impacted gallstone results in gallbladder distension and edema with acute inflammation. [3]. Acute cholecystitis is

common indication for hospital admission and an increasing burden on the western healthcare system in the United States, the number of hospital admission for acute cholecystitis increased by 44% during 1997-2012, from 149661 to 21599 [4]. The diagnosis of acute cholecystitis is based on a combination of clinical criteria (acute right upper quadrant tenderness, temperature exceeding 37., and white blood cell count greater than 10 × 109/ l) and Ultrasonographic criteria (thickened, edematous, distended gallbladder; positive sonographic Murphy's sign; presence of gallstones; and pericholecystic fluid collection [5]. Laparoscopic cholecystectomy has become the gold standard in the treatment of symptomatic gall stones [2]. The major advantages of laparoscopic cholecystectomy include less postoperative pain, less time required for hospitalization, recovery and better cosmetic results [2]. Early in the laparoscopic era, acute cholecystitis was considered to be a relative contra-indication for laparoscopic cholecystectomy [6]. This was challenged by studies advocating early surgery for acute cholecystitis. Early laparoscopic cholecystectomy, within 72 hours of presentation, has been advocated because of shorter hospital stay, decreased financial costs and reduced readmission rates. Many general surgeons still prefer to manage acute cholecystitis non-operatively initially and perform a delayed laparoscopic cholecystectomy [7]. Previously cited reasons against early laparoscopic cholecystectomy include the increased technical difficulties, increased risk of conversion to an open procedure (6-35 % in some studies) and increased risks of biliary complications such as bile leaks and common bile duct injuries when operating on an inflamed gallbladder with edematous planes and distorted anatomy. Several studies showed that early laparoscopic cholecystectomy is comparable to delayed laparoscopic cholecystectomy in terms of conversion rate, postoperative morbidity. Despite this evidence, a delayed laparoscopic cholecystectomy performed at least 6-8 week after the symptom's onset is still frequently preferred to early laparoscopic cholecystectomy in clinical practice [8]. Laparoscopic cholecystectomy can be done as early laparoscopic cholecystectomy or delayed laparoscopic cholecystectomy after conservative treatment. However, the definition of early varies among guidelines, the British society of Gastroenterology recommend cholecystectomy within the same hospital admission or up to 2 weeks after discharge. The American Gastroenterological Association guidelines suggest that cholecystectomy should be performed as soon as possible and in no case beyond 2-4 weeks after discharge, whereas the American college of Gastroenterology recommends cholecystectomy within the same hospital admission [9]. In young, otherwise healthy patients early laparoscopic cholecystectomy is considered the treatment of choice for acute Calculous cholecystitis. In high-risk patients the management of acute cholecystitis remains controversial [10]. Early laparoscopic cholecystectomy has been adopted as the treatment of choice for acute cholecystectomy due to shorter hospital length of stay and no increased morbidity when compared to delayed treatment of choice for acute cholecystitis [11]. However, randomized studies and meta-analysis report a wide array of timing of early cholecystectomy, most of them set at 72 hour following admission. Setting early cholecystectomy at 72h or even later may influence analysis due to a shift towards a more balanced comparison [11]. At this time, the rate of resolving acute cholecystitis and the rate of ongoing acute process because of failed conservative treatment could be not so different when compared to those operated with a delayed timing of 6-12 weeks [11]. Delayed laparoscopic cholecystectomy has been preferred for acute cholecystitis in the past,

out of fear of a higher complication rate because of increased local inflammation and difficulty in dissection of Calot's triangle recent analysis are in favor of early surgery which seems to be feasible and safe, and it offers both medical and socioeconomic benefits compared with delayed interval surgery [12]. As a result, delayed surgery is now chosen under certain situations such as a prolonged time from onset to presentation, patient's comorbidity, age and emergency medical system in each hospital, among other reasons of laparoscopic cholecystectomy for acute cholecystitis is surgery with a high degree of surgical difficulty and surgeons sometimes encounter difficult cases that require conversion [13].

2. Patients and Methods

Twenty patients were included in this study, this study is analytical prospective limited study, it is carried out on 20 patients only presented with acute cholecystitis admitted in the general surgery department at AL-Zahraa University Hospital in the period from March 2021 to September 2021. The diagnosis of acute cholecystitis was performed clinically (history taking, general and local examination) and followed by ultrasonography in all patients. This study was done by general surgery consultant who is expert in laparoscopic surgery.

2.1 All the 20 patients in the study were subjected to the following: Informed consent was obtained for all patients and approved by local ethical committee.

- **Detailed history including:** Personal history specially (Name, age, sex), Complaint include (pain, fever, nausea, vomiting), Present history include analysis of patient complaint and other symptoms suggestive other system affection, past history of similar attack, recurrent biliary colic or other diseases, history of previous operation or medication and family history.

- **General examination and local abdominal examination:** With special attention to presence of tenderness, guarding, rigidity, palpable mass and positive murphy sign at right hypochondrium.

- **Investigations:** Laboratory investigation: specially (CBC, liver function tests, renal function tests, alkaline phosphatase), abdominal US.

- **Demographic data:** A Demographic data include age, sex, preoperative symptoms and signs in the form of (abdominal pain ,fever , pain and tenderness of Rt hypochondrium , Murphy sign) , laboratory data in the form of (TLC , AST , ALT , total and direct bilirubin) , Ultrasonographic finding , intra operative data in the form of (adhesions , bleeding , biliary leak, intestinal injury , conversion to open due to adhesions), postoperative evaluation for bleeding , bile leak , bile duct injury , intestinal fistula , fever , pain , wound infection) and laboratory data (TLC , AST , ALT , total and direct bilirubin).

2.2. Inclusion criteria

Age between 18:57 years, both sexes were included, patients with acute cholecystitis.

2.3. Exclusion criteria

Patients with chronic cholecystitis, patients with advanced liver disease, patients with obstructive jaundice, patients presented with any of absolute contraindication for laparoscopic cholecystectomy, Patients presented with any of comorbidity (unfit) for general anesthesia not related to the systemic response to acute inflammation, Perforated acute cholecystitis with generalized peritonitis, Cholangitis. *All patients were treated by early laparoscopic cholecystectomy after admission (in first 3 days).*

- **Preoperative preparation:** Third generation cephalosporin 1gm and one bottle(100cm) metronidazole were administered IV one hour before surgery as prophylactic antibiotics.

- **Operative technique (steps):** 4-Port laparoscopic cholecystectomy**.** The operative steps of laparoscopic cholecystectomy were cleared in the next Fig. 1, 2, 3, 4, 5.

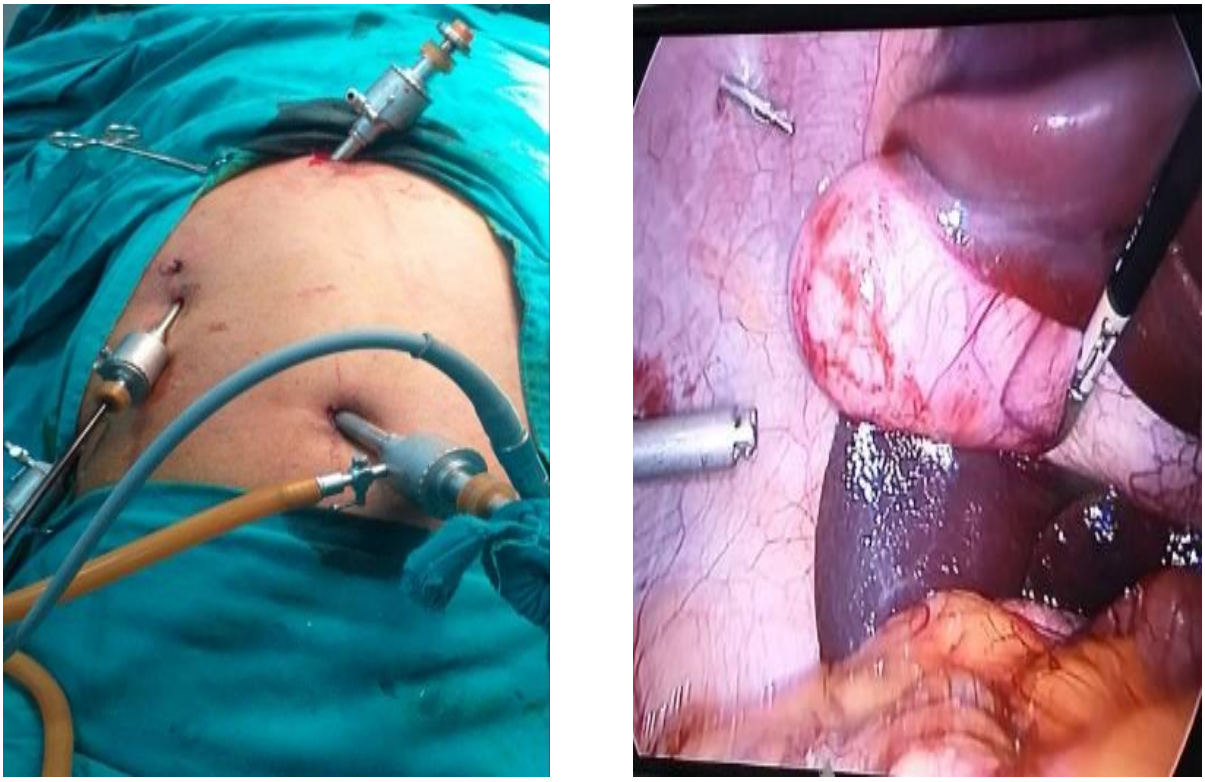
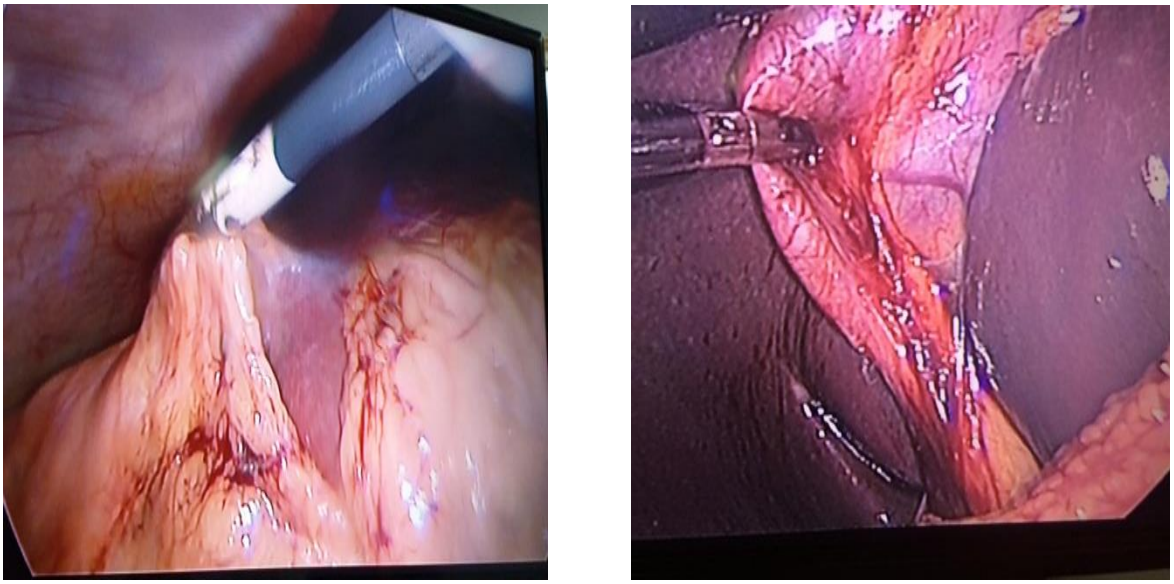
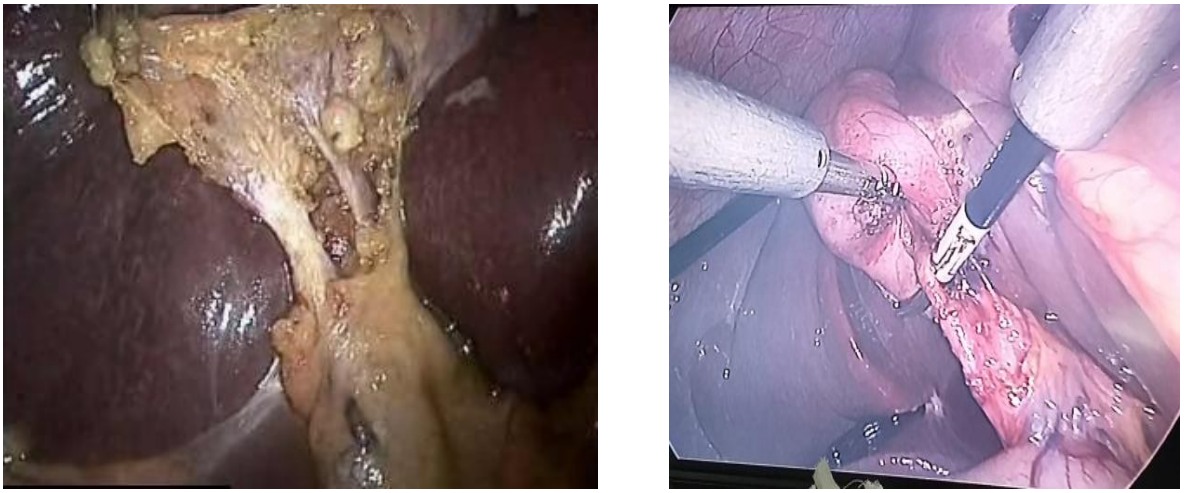


Figure (1): Insertion of trocar.



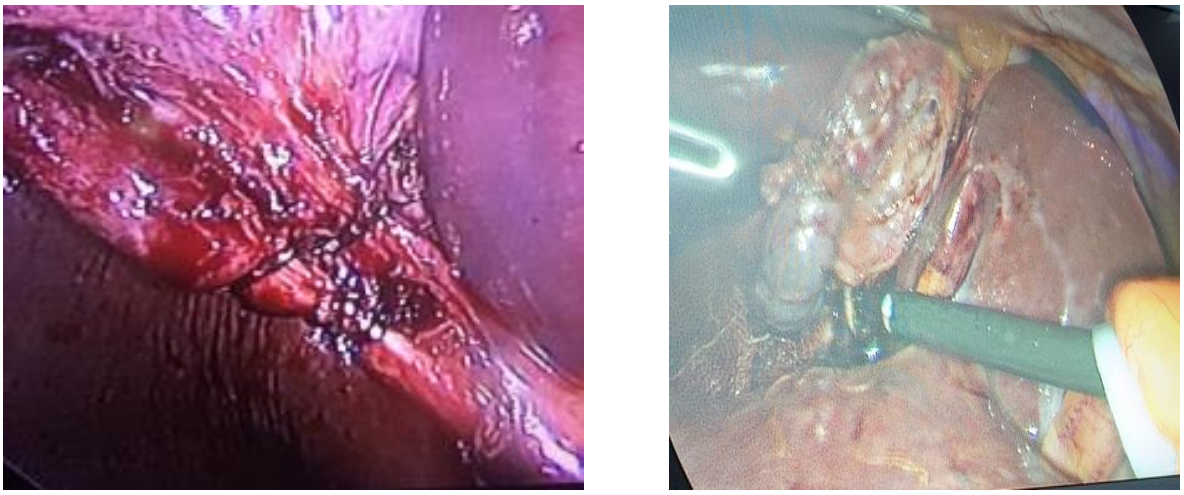
(a) (b)

Figure (2): (a) Severe adhesions were found between the liver and omentum and anterior abdominal wall, (b) Dissection of cystic artery.



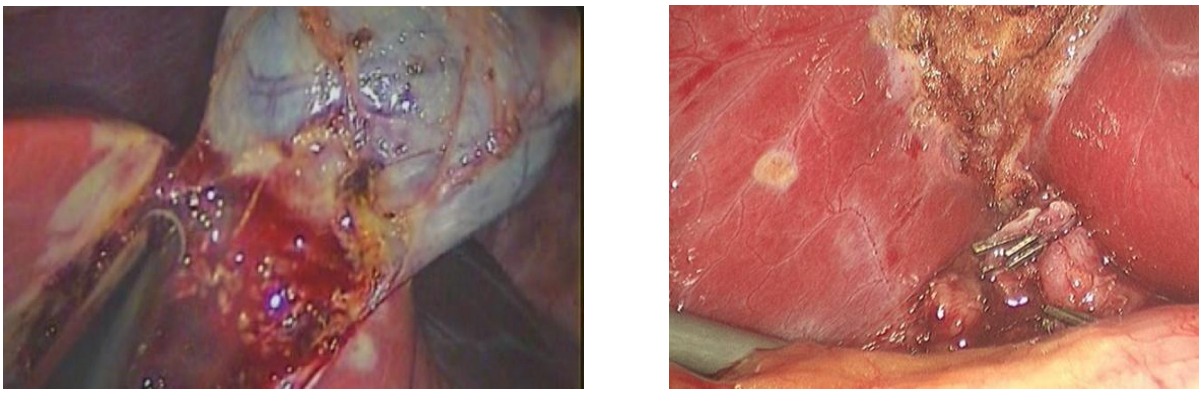
(a) (b)

Figure (3): (a) Critical view of safety, (b) Dissection of cystic duct.



(a) (b)

Figure (4): (a) Clipping of cystic duct, (b) Hook electro-cautery used to dissect the gallbladder off the liver bed.



(a) (b)

Figure (5): (a) Removal of the gall bladder from its bed, (b) Clean liver bed with clipped cystic duct and cystic artery.

2.4. Postoperative management: All patients received good support from intravenous maintenance fluid, analgesics and had oral liquids after the operation once there was normal bowel movement and no nausea nor vomiting. Then all patients were observed for bleeding, jaundice, pain, bowel injury, bile leak, wound infection, signs of abdominal collection like pain, fever, tenderness, guarding and rigidity, these complications occur within the first few days postoperatively. The majority of patients were discharged from the hospital after 24 hours .

3 .Results

Results of our study are the age ranged from 18 – 57 years with mean age (39.65 ± 11.31) they were 11 females (55.0%) and 9 males (45.0%). (Table 1)

Table (1): Demonstrate age and sex distribution among the studied patients.

		No. of cases = 20 Percentage%
Age	Mean	39.65 ± 11.31
	Range	18 – 57
Sex	Females	11cases (55.0%)
	Males	9 cases (45.0%)

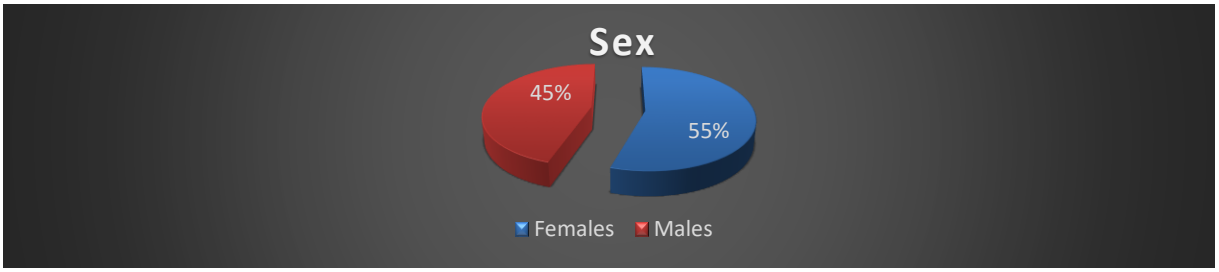


Table (2): Demonstrate time, site of pain and fever among the studied patients.

Pain		**No. of cases = 20 Percentage%**
Time of pain (hrs.)	Mean	2.05 ± 0.83
	Range	24– 72 hrs.
Site of pain	Rt. Upper quadrant	10 cases (50.0%)
	Rt. Upper quadrant with epigastric	10 cases (50.0%)
Fever	Mean	37.90 ± 0.39
	Range	37.2 – 38.6 15 cases (75%)
	Mild	13 cases (65%)
Pain degree	moderate	7 cases (35%)

Table (3): Demonstrate site of tenderness and Murphy's sign among the studied patients.

Tenderness		**No. of cases = 20 Percentage%**
Site	**Rt. Hypochondrium**	10 cases (50.0%)
	Rt. Hypochondrium& Epigastric	10 cases (50.0%)
Murphy's sign	**Negative**	4 cases (20.0%)
	Positive	16 cases (80.0%)

Table (4): Demonstrate laboratory data of the studied patients.

LAB		**No. of cases = 20 Percentage%**
TLC	Mean	12.71 ± 4.30
	Range	7.5 – 24.4 elevated in 15 cases (75%)
ALT	Mean	25.40 ± 6.70
	Range	12 – 37
T. Bilirubin	Mean	0.72 ± 0.24
	Range	0.35 – 1.1
D. Bilirubin	Mean	0.24 ± 0.12
	Range	0.06 – 0.6
AST	Mean	27.50 ± 9.17
	Range	13 – 40

Table (5): Demonstrate ultrasonographic data of the studied patients.

Radiology		**No. of cases = 20 Percentage%**
U/S	MSS	12 cases (60.0%)
	SSS	2 cases (10.0%)
	SLS	6 cases (30.0%)

MSS: multiple small stones. SLS: single large stone. SSS: small single stone

Table (6): Demonstrate intraoperative data of the studied patients.

Intraoperative data		**No. of cases = 20 Percentage%**
Intra operative adhesions	Dense fibrous	2 cases (10%)
	Fibrinous	9 cases (45.0%)
	Omentum only	7 cases (35%)
Intra op phlegmon	No	16 cases (80.0%)
	Pyocele	2 cases (10.0%)
	Omentum & Bowel	2 cases (10.0%)
Intra op decompression	No	17 cases (85.0%)
	Yes	3 cases (15.0%)
Intra op spillage of GB content	No	16 cases (80.0%)
	Yes	4 cases (20.0%)
Conversion to open	No	18 cases (90.0%)
	Yes	2 cases (10.0%)
Cystic duct dilated or not	No	18 cases (90.0%)
	Yes	2 cases (10.0%)
Intra op bleeding	No	20 cases (100.0%)
	Yes	0 cases (0.0%)
Operation time	Mean Range	(60.19 ± 10.17) (50-70 min)

Table (7): Demonstrate postoperative data of the studied patients.

Postoperative		No. of cases = 20 Percentage%
Post op bile leak or bile duct injury	No	20 cases (100.0%)
	Yes	0 cases (0.0%)
Post op seroma or wound infection	No	18 cases (90.0%)
	Yes	2 cases (10.0%)
Post op fever	No	18 cases (90.0%)
	Yes	2 cases (10.0%)
Post op bleeding	No	20 cases (100.0%)
	Yes	0 cases (0.0%)
Post op pain	Mild	18 cases (90.0%)
	Moderate	2 cases (10.0%)
Hospital stays (days)	Mean ± SD	1.20 ± 0.62
	Range	1 – 3 days

3. Discussion

The present study included twenty patients with acute cholecystitis, to all of them early LC was performed, aiming at evaluating the feasibility and safety of LC by assessing the impact of severity of disease on the intraoperative difficulty and the rate of postoperative complication in cases with AC. As there is a controversy over the timing of laparoscopic cholecystectomy in AC, this study aimed also at recognizing which time is best for surgery. In our study the mean time of surgery days was (2.05 ± 0.83days) and the range was (1-3 days). A study done by Al-Ashry et al. (2020), reported that the mean time of surgery days was (4.18±2.59 days) and the range was (1-11 days). In the mild group, LC was performed within three days from the onset of symptoms. The mean time in days was (2.27±0.8) and the range was (1-3). All patients of the moderate group were presented more after three days from the onset of symptoms and the mean time of surgery in days was (6.25±2.25) and the range was (4-11 days). The difference between mild and moderate groups is statistically significant ($p < 0.001$). The findings agreed another study done on 2014 where it was reported that the mean time of surgery in mild group (2 ± 0.9) with range (1-3) days. The mean time was also longer in the moderate group (5.84 ± 2.62) with range (4-15) days. In a different study done somewhat later on 2017 it was also reported that the mean time in the mild group (1.8 ± 0.7) with range (1-3) days, which was longer in the moderate group with mean (6.6 ± 3.1) with range (4-10) days.(14) Our study reported that the mean age was (39.65 ± 11.31) and the range was (18 – 57) also reported that the percentage of female patients was 55% (11cases) and percentage of male patients was 45% (9 cases). Schirmer et al. (2005) reported that during the reproductive years, the female-to-male ratio is about 4:1, with the sex discrepancy narrowing in the older population to near equality. [15] Zgheib et al. (2019) reported that patients in the AC+ group had slightly higher mean age (53±19.7 years), were more commonly of female gender (64%), and more likely to have an ASA score of 3 (34.1%(16).(Our study reported that the mean of pain time was (2.05 ± 0.83) and the range was(1-3 days) also reported that the pain site was in Rt hypochondrium in 10 cases(50%) and was in Rt hypochondrium associated also with epigastric pain in 10 cases(50%) and the mean fever was (37.90 ± 0.39) and the range was (37.2 – 38.6) the pain was mild in 13cases(65%)and moderate in 7cases(35%) according to VAS (visual analogue scale). Our study reported that 10 cases (50%) were presented with tenderness of Rt hypochondrium and 10 cases (50%) were presented with Rt hypochondrium associated with epigastric tenderness.

Murphy sign was positive in 16 cases (80%) but was negative in 4 cases(%20) . Al-Ashry et al. (2020) reported that significant difference between mild and moderate group according to pain [14]. Our study reported that there was leukocytosis in 15 cases (75%) while other parameters (ALT, AST, total and direct bilirubin) were within normal. Zgheib et al. (2019) did a retrospective cohort study of adult patients with AC found in the American College of Surgeons National Surgical Quality Improvement Program database from 2008 to 2016. Patients were classified into two groups, without CBDS (AC–) and with CBDS (AC+). LFT results namely total bilirubin, SGOT and ALP were collected and categorized into normal and abnormal with the cut-offs of 1.2 mg/dl for total bilirubin, 40 U/L for SGOT and 120 IU/L for ALP. Measures of diagnostic accuracy for individual and combinations of LFTs were computed. They showed that Mean LFT results were significantly higher in the AC+ group for total bilirubin (1.82 vs 0.97), SGOT (110.9 vs 53.3) and ALP (164.4 vs 102.3) ($p < 0.0001$). The proportions of abnormal LFTs were significantly higher in the AC+ group for total bilirubin (47.7% vs 20.2%), SGOT (62.8% vs 27.1%) and ALP (56.6% vs 21.0%) ($p < 0.0001$). Among AC+, the odds of having abnormal results for bilirubin, SGOT and ALP were found to be 3.61, 4.54 and 4.90 times higher than among AC–, respectively [16]. There are several mechanisms may be responsible for the false negative and false positive LFTs in AC patients. In theory, CBD stones cause biliary obstruction with increased intra-biliary pressure due to hindrance of bile flow and subsequent periductal inflammation and hepatocellular injury with elevated LFTs. However, partially obstructing stones may not cause elevated bilirubin levels thus generating false negative values. It is also possible for stones to spontaneously enter or pass from the CBD during the time period between blood sampling and surgery, thereby leading to both false negative or positive results, respectively (Zgheib et al., 2019) [16]. The presence of sludge or microlithiasis in the common bile duct could lead to an increased bile viscosity with subsequent elevation in liver function tests whereas they may go undetected on intraoperative cholangiography after they are washed out by the contrast medium to the duodenum, thus increasing the population of AC– patients with abnormal LFTs. Cases of concomitant Sphincter of Oddi dysfunction, conjugation defects or Mirizzi syndrome34 among others may also display elevated liver function test results in the absence of CBDS (Zgheib et al., 2019) [16]. Our study reported that there was US findings of acute cholecystitis in the form of gallbladder distention, wall thickening, pericholecystic inflammation, multiple small stones, single large stone or single small stone. In a systematic review by Kiewiet et al. (2012), they observed that Chol scintigraphy has the highest diagnostic accuracy of all imaging modalities in the detection of acute cholecystitis. The accuracy of US leaves a substantial margin of error, comparable to that of MR imaging, while CT is still under evaluated [17]. As regards intraoperative findings, the most determinants of intraoperative difficulties are the presence and the type of adhesions forming the gall bladder phlegmons. Our study reported that there were intraoperative dense fibrous adhesions in 2 cases (10%), fibrinous adhesions in 9 cases (45%) and omentum only in 7 cases (35%), intraoperative phlegmon in the form of omentum and bowel in 2 cases (10%) and the form of pyocele in 2 cases (%10). Al-Ashry et al. (2020) reported that the most consistent intraoperative finding was the presence of pericholecystic adhesions and gall bladder phlegmons which were present in all patients. Fibrinous adhesions were found in 72% of cases, while dense adhesions were found in 28% of cases [14]. This was in agreement with the results of the study done by Brooks et al. (2013), which

reported the presence of pericholecystic adhesions and gall bladder phlegmons in all patients included in their study [18]. Again, in another study done on 2013, the same results were also reported by (Barcelo et al., 2013). However, similar results were reported in pericholecystic adhesions and phlegmons to be in 94% of patients [20]. This was correlated with a study done by Loozen et al. (2017), which reported a higher incidence of dense adhesions in the moderate group than mild group (52% versus 10% respectively) however, the incidence of fibrinous adhesions was higher in the mild group than moderate group (90% versus 48% respectively) [21]. This also was correlated with the results of the study done by (De Mestral et al., 2014) by researchers, who reported higher incidence of dense adhesions in the moderate group than the mild group (59% versus 16% respectively) and higher incidence of fibrinous adhesions in the mild group than moderate group (84% versus 41% respectively) [22]. This was in agreement with results of a previous study by (Brooks et al., 2013) which reported higher incidence of omentum and bowel phlegmons in the delayed group 63% versus 37% in the early group. Similar results were also obtained before that phlegmons tend to be complex (omentum and bowel) with the longer time from the onset of symptoms and being simple (omentum only) with the shorter time from the onset of symptoms [18]. These results are in line with the study done by (Bansal et al., 2015) where it was reported that phlegmons are seen in 76% of early group, which of omentum variety, whereas omentum and bowel variety seen in 68% of the delayed group [19]. Similar results were reported by studies done on 2016 and 2017, as delayed groups were associated with higher incidences of omentum and bowel phlegmons (67% and 72% respectively), however early group were associated with higher incidences of omentum phlegmons (92% and 83% respectively). Another common intraoperative finding encountered during LC for AC is the tensely distended and edematous gall bladder, which is difficult to handle. In our study needle decompression of an edematous gall bladder was required in 3 cases (15%) of cases . In a study done by Al-Ashry et al. (2020), needle decompression of an edematous gall bladder was required in 44% of the studied cases, of which 46% of patients in the moderate group which was slightly higher than the mild group (42%). However, the difference is being statistically insignificant. The difference among the timing groups also being statistically insignificant, in which decompression was required in 42% of group 1, 50% of group 2 and 37.5% of group 3 [14]. This was correlated with a study on 2013 by (Brooks et al., 2013), which reported intraoperative decompression of gall bladder in half of the studied cases and also reported decompression 42% and 39% of the studied cases respectively [18]. This was in agreement with the study done before hand (2017) by Loozen et al. (2017) which reported a higher incidence of intraoperative decompression in the moderate group than the mild group (55% versus 50%) [21]. Similarly, in 2014 it was reported in a study done by (De Mestral et al., 2014) that there was slightly higher incidence of intraoperative decompression in the moderate group than the mild group (37.5% versus 36% respectively) [22]. In our study there was intra operative Spillage of gall bladder contents either bile or stones in 4 cases (20%) of cases. In a study done by Al-Ashry et al. (2020) Spillage of gall bladder contents either bile or stones, occurred only in the moderate group (12.5%) and did not occur in any patient of the mild group [14]. This was correlated with the study by Loozen et al. (2017) which reported that spillage of contents had been observed in one third of the cases of the moderate group and only in 3% of the mild group [21]. In our study there was cystic duct dilatation in 2 cases (10%) of cases. In a study done by Al-Ashry et al.

(2020), There was a higher incidence of dilated cystic duct in the moderate group (25%) than the mild group (15%) and the difference being statistically insignificant. This was correlated with the study which reported that spillage of contents had been observed in one third of the cases of the moderate group and only in 3% of the mild group. Also correlated with the study which reported wide cystic duct in one case of early (group 3%). In the delayed group, the cystic duct was wide in 3 cases 12% [14]. Our study reported that there was conversion to open in 2 cases (10%) of cases. In a study done by Al-Ashry et al. (2020), the overall conversion rate was 6%, there was no incidence of conversion among patients with mild AC, while the rate was 12.5% in patients with moderate AC but the difference being statistically insignificant. This agrees with other studies; that reported an overall conversion rate of 10.5% in patients with AC, which was higher in the moderate AC (16.12%) than in the mild (11.11%). Conversion to open in 12.5% of cases was reported. Significantly more cases were converted in the moderate group (15 cases: 20.3 %) compared to the control group (4 cases: 5.1 %). However, a much lower rate of conversion; was reported, the overall rate was 0.9% and the rate in the mild AC was 0.7% compared to the moderate AC 1.3% [14]. Zhu et al., 2012, reported that there was no conversion to open cholecystectomy in their study [23]. In our study there was no intra operative bleeding . In a study done by Al-Ashry et al. (2020), there was no significant intraoperative blood loss in all patients. The mean blood loss was (55 ± 52.31) ml with range (10-225) ml for all studied cases. time than patients undergoing delayed LC (beyond 72 hours) [44.1 ± 5.32 versus 66.4 ±3.05 min] [23]. Furthermore, it was in agreement with several studies included in a meta-analysis of case control studies, in which the duration of surgery was reported by 60 studies. The mean duration was 89.3 min in the early group and 95.7 min in the delayed group [24]. Another study reported an increased average duration of the operation from 75.9 minutes to 90 minutes in a delayed cholecystectomy [28]. This was in contrast with a previous study done on 2014, that reported the mean operative time for LC in the early group was 54.8 ± 19.9 (range 35- 9 0) min. In the delayed LC group was 47.8 ± 25.0 (range 25- 120) min [29]. This also was in contrast with several other studies Meta-analysis of randomized controlled trials, 2015, which reported that a significant heterogeneity among included studies and the operating time was significantly longer in the early group than the delayed group [26]. Similarly, it was reported that early LC was associated with increased duration of operation. Although the mean duration of surgery was increased in the early group, it was not statistically significant [27]. Our study reported that there was no postoperative bleeding, no postoperative bile leak or bile duct injury, there was postoperative fever in 2 cases (10%), also there was postoperative wound infection in 2 cases (10%). Postoperative pain was mild in 18 cases (90%) and moderate in 2 cases (10%) according to VAS (visual analogue scale) . A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous ± their pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest. It was to capture this idea of an underlying continuum that the VAS was devised. Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimeters from the left-hand

end of the line to the point that the patient marks. There are many other ways in which VAS have been presented, including vertical lines and lines with extra descriptors [25]. In a study done by Al-Ashry et al. (2020), the overall postoperative complications rate was 6%. There was no incidence of bile leak or bile duct injury or postoperative bleeding, and no mortality was documented. One patient of the moderate group experienced port site (epigastric) infection (4%). Another patient of those converted to open cholecystectomy, experienced wound seroma and postoperative ileus. None of these complications were observed in the mild group. Grade II AC was associated with significant higher incidence of more severe postoperative pain than grade I and consequently. Grade II AC being also associated with significant higher incidence of postoperative fever (37.5%) than grade I(%8) . The results of this study concur with the study which reported that early cholecystectomy was associated with a lower risk of major bile duct injury, they reported an increased incidence of postoperative complications in the moderate AC than mild AC [0.53% versus 0.28% respectively] with an overall complication rate being 11%. Also results of this study was that moderate AC was associated with a significant higher severity of postoperative pain than mild AC. There was no significant impact of timing of surgery on postoperative complication, Seroma, port site infection. None of these complications were observed in group 1 or group 2. Complication rate in delayed LC (group 3) was 25%. However, there was significant impact of timing of surgery on the postoperative fever, pain, meanwhile, there was a higher incidence of elevated postoperative temperature in the delayed group 3 (>7days) (37.9 ±0.8) than intermediate group 2 (37.2 ± 0.54) and early group 1(37.05 ±0.18). There was a higher incidence of more severe pain in the delayed group 3 than group 2 and being least in the early group 1. An overall complication rate was reported to be 17.5%. The only intraoperative complication that occurred in the delayed LC group was a type D bile duct injury according to the Strasberg's classification. The complication rate was 16.9% in the early LC group and 18.7% in the delayed LC group . In 2015, no incidence of bile duct injury, bowel injury or any significant blood loss were recorded for either group. There was no incidence of wound infection or persistent abdominal pain. No mortality was documented. There was a general trend towards occurrence of 50 % reduction in bile duct injuries in the early groups. Bile leaks reported in the early group (1.7 %) and in the delayed group (2.3 %). There was a similar trend of fewer bile leaks in the early compared with delayed groups. Wound infections rate in the early group was (2.7 %) and (4.1 %) in the delayed group. In the subgroup analysis, there was a general trend towards decreased wound infections in the early compared with delayed groups [14]. In our study the mean of postoperative hospital stay was (1.20 ± 0.62 days) and the range was (1 – 3 days). The mean of the hospital stays, in the study done by Al-Ashry et al. (2020), was (28.32±12.54) hours, with range (24-96) hours. The severity of AC has a significant impact on the hospital stay (p=0.016). The mean was (33 ±17.06) hours in moderate group, while, in the mild group, it was 24 hours [14]. This was in agreement with previous study done before, which reported the length of stay sequentially increased with disease severity, meanwhile, patients with grade I AC had a significant decreased length of stay compared to patients with grade II AC. The median length of stay was 2 days in grade I AC versus 5 days in grade II . Also, in this study which done by Al-Ashry et al. (2020), the time of surgery has a significant impact on the hospital stay ($p < 0.001$). The hospital stay was significantly longer in the delayed group 3 in which the mean was (45±23.9 hours) than as it was in group 2 (27±8.2 hours) and being least in the early group 1(24 hours).

This was in agreement with what was reported by the researchers before that the mean total hospital stay was 6.3 (range 3-13) days and 10.5 (range 7-23) days for early LC and delayed LC group, respectively, with a statistically significant difference [14].

4. Conclusion

Early laparoscopic cholecystectomy is safe and feasible for acute cholecystitis with the additional benefit of shorter total hospital stay.

5. Limitation

This study is limited by its small number of patients and short time of follow up so for more evaluation we are in need for a greater number of patients and more time for follow up.

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