Early elective laparoscopic cholecystectomy during the same hospital admission after recovery of an attack of mild acute biliary pancreatitis: is it feasible and safe?

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Objective
We are aiming to identify the safety and feasibility of early laparoscopic cholecystectomy (LC) directly after the improvement of manifestations of an attack of mild acute biliary pancreatitis (MABP).
Patients and methods
This study included 150 patients of MABP. Patients were allocated into two groups: group same admission-laparoscopic cholecystectomy (SA-LC) (n=80) who underwent LC in the same hospital admission of MABP after improving the indicator of the acute inflammation, and group delayed laparoscopic cholecystectomy (D-LC) (n=70) who underwent LC 4–6 weeks after recovery of acute biliary pancreatitis. Patients' data were collected during and after surgery; thereafter, the gathered data were statistically analyzed.
Results
No significant differences between both groups about the mean operative time (P=0.162) were observed; however, the mean operative time was higher in the delayed elective group (SA-LC=48.12±10.44 and D-LC=50.56±11.43). The incidence of bile leakage was 1/80 and 1/70 in SA-LC and D-LC, respectively. Moreover, there was no significant difference between both groups with regard to the conversion rate, length of ICU admission, and the postoperative hospital stay days.
Conclusion
Undergoing LC during the same hospital admission after an attack of MABP is a feasible and safe operation. Furthermore, it stops the event of readmission due to gallstone-related complications.

Keywords:
biliary pancreatitis, delayed operation, early elective, laparoscopic cholecystectomy

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Introduction

Nowadays, acute pancereatitis (AP) is a very common problem that patients present with to the emergency department with a yearly incidence reaching about 35/100 000 population in some regions [1]. Worldwide, the most common type of AP is biliary pancreatitis due to cholelithiasis, accounting for up to 70% of cases [2]. About 80% of cases with AP have mild episodes, according to the Atlanta classification [3]. In contrast, around 20% of patients suffer a severe attack, which is defined by the presence of organ failure continuing more than 48 h [3,4], and it is also accompanied with high morbidity and a probable mortality rate of up to 30% [2].

Several studies have found that the chance of recurrence of AP without cholecystectomy is up to 33% [5]. These studies concluded that removal of the gallbladder and its contents of stones is the best solution for reducing the probable recurrence of acute biliary pancreatitis [6,7]. The International Association of Pancreatology mentioned that removal of the gallbladder is a definitive treatment to avoid the recurrent attacks of acute gallstone pancreatitis [8,9]. However, for different reasons, around 50% of patients do not undergo operations for gallbladder removal regardless of existing guidelines [10,11].

The goal of our cohort study is to concentrate on the comparison between the early elective laparoscopic cholecystectomy (LC) in the same admission-laparoscopic cholecystectomy (SA-LC) and the delayed laparoscopic cholecystectomy (D-LC) after an attack of mild acute biliary pancreatitis (MABP). We are trying to avoid the heterogeneities that

occurred in previous similar studies that used variable criteria for the severity of AP.

Patients and methods

This study was completed in the General Surgery Department and the Hepatology, Gastroenterology and Infectious Diseases Department at Benha University Hospital in Egypt and King Saud Hospital in Saudi Arabia from June 2017 to June 2019. The study included 150 consecutive patients who came to our hospitals in an acute attack of MABP. The study protocol was approved by the ethical committee. Patients were informed in detail about the benefits and hazards of each management plan. For participating in the study, a written consent was signed by each patient.

We had two types of patients. Type one included patients who were admitted through the emergency room for management of an attack of MABP. Patients who were designated for LC, and who agreed, were considered for SA-LC group after the manifestations of AP subsided. The second type included the following patients: (i) patients from the first type who refused SA-LC and chose D-LC and (ii) patients who were referred from other hospitals for probable LC after a recent improvement of an attack of MABP; these patients were selected in D-LC, and they underwent LC 4–6 weeks following the improvement of MABP. Patients were divided into (i) group A (SA-LC), including 80 patients and (ii) group B (D-LC), including 70 patients.

Patients were evaluated by the Surgery, Hepatology, and Gastroenterology teams; laboratory examinations were carried out for them, such as complete blood count, C-reactive protein, random blood sugar, serum amylase, serum lipase, liver function tests, blood urea, and serum creatinine. Thereafter, radiological examinations were performed for every patient, such as plain radiograph, abdominal ultrasonography, computed tomography scans, and MRCP. The diagnosis of biliary pancreatitis was considered by the treating team if the patients had (a) acute pain, tenderness in the upper abdomen, nausea, and vomiting, (b) there was no alcohol abuse, (c) serum lipase was at least 370 U/l, and (d) if there were stones or sludge in the gallbladder confirmed by the radiological images [12,13].

Inclusion criteria in our study comprised the following (and they are): patients who were diagnosed as having MABP and scheduled for LC, aged at least 18 years, having no common bile duct (CBD) stones, and having an American Society of Anesthesiology (ASA) score of I–III. Our exclusion criteria in this study were as follows: pregnancy, ASA score more than III, organ failure, systemic or local complications of AP, chronic pancreatitis, patients with psychiatric illnesses, and patients who were participating in other studies. All important clinical, demographic, intraoperative, and postoperative (PO) data were collected and analyzed.

The management plans

(1) Preoperative evaluation and preparation
In group SA-LC, on admission, the diagnosis of mild acute biliary pancreatitis was confirmed depending on clinical, laboratory, and radiological examinations. Patients were managed conservatively, and the absence of CBD stones or any complication of AP was confirmed. He/she was given the chance to select one of the management strategies, as soon as the patient had the following (and they are): (i) pain score less than 2 (ii) no abdominal tenderness, and (iii) serum lipase falling within the normal range (73–370 U/l) or dropped to less than 50% of the highest level. There were no patients in our study who underwent preoperative endoscopic retrograde cholangiopancreatography (ERCP), as any patient with a predictor of CBD stones was excluded.
In group D-LC, after improvement of manifestations of MABP, patients were discharged home for 6 weeks, and they were then readmitted through the outpatient clinic and prepared for LC.
In both groups, MRCP was performed for every patient. All equipments and materials needed for intraoperative cholangiography (IOC) were prepared in patients who have mild dilated CBD without definite CBD stones in the MRCP. On the day of surgery, antibiotic prophylaxis (cefazoline 2 g) was administered through the intravenous line 1 h before the LC.
(2) Operations
All operations started through a laparoscopic approach. The operations were started by a three-port technique, and a fourth port (at the right anterior axillary line) was inserted if needed. Cholecystectomy was performed as a usual procedure. An IOC was performed in selected cases having mild dilated CBD without definite CBD stones in the MRCP. A drain was left in the Morison's pouch for all open procedures;

however, in LC, the drain was kept only in selected cases. In a few cases, when indicated, the laparoscopic approach was converted to an open procedure through a right subcostal incision (A=2 and B=2).

(3) PO care
After operations, the majority of patients shifted to the ordinary beds. However, some patients (SA-LC=3 and D-LC=2) were sent to the ICU. An antibiotic was continued intravenously for 1 day after LC, and prophylactic measures from deep vein thrombosis (DVT) were carried out. Oral meal resumed gradually after 8 h PO. The drain was removed on the first PO day or when it became less than 50 ml in 24 h. Patients were discharged home once they returned to the normal diet and bowel habit with a good general condition and acceptable laboratory tests. The follow-up continued in the outpatient clinic until they became completely improved and had no more PO morbidities. The retained CBD stone was accidentally found on the IOC in one patient in each group, and ERCP was carried out after surgery.

Statistical analysis

Data are presented as mean±SD, ranges, numbers, and ratios. Results were analyzed using Wilcoxon's ranked test for unrelated data (*Z*-test) and χ^2-test for numerical data. Statistical analysis was carried out using the SPSS version 21 (SPSS Inc., Chicago, Illinois, USA) for the windows statistical package. The *P* value was considered as statistically significant if it was less than 0.05.

Results

The study included 150 patients after an episode of MABP, and they were divided into two groups: group SA-LC (*n*=80) for patients who underwent LC in the same hospital admission after improvement of symptoms of an attack of MABP and group D-LC (*n*=70) for those who underwent LC 4–6 weeks after improvement of MABP (delayed elective operation).

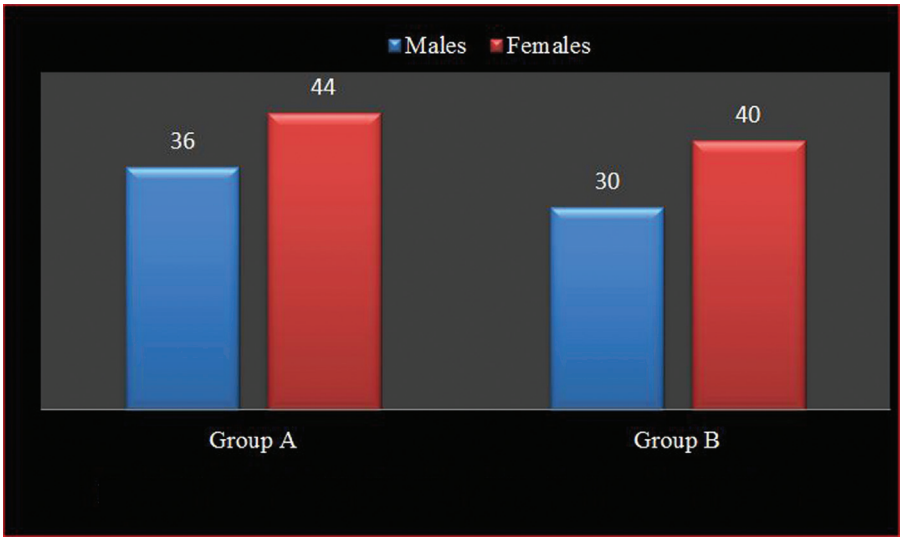
No difference among patients of both groups with regard to the sex, age, BMI or ASA scores was observed. Furthermore, clinical findings and medical

Table 1 Patients' demographic and preoperative clinical data

Data	Strata	SA-LC group (*n*=80)	D-LC group (*n*=70)	*P* value
N (%)	150	80 (53)	70 (47)	
Age (years)		42.21±9.33 (21–65)	41.61±5.23 (20–69)	0.465
ASA score		1.72±0.55 (1–3)	1.69±0.73 (1–3)	0.620
BMI (kg/m^2)		29.89±4.11 (27–35)	30.62±3.41 (26–35)	0.534

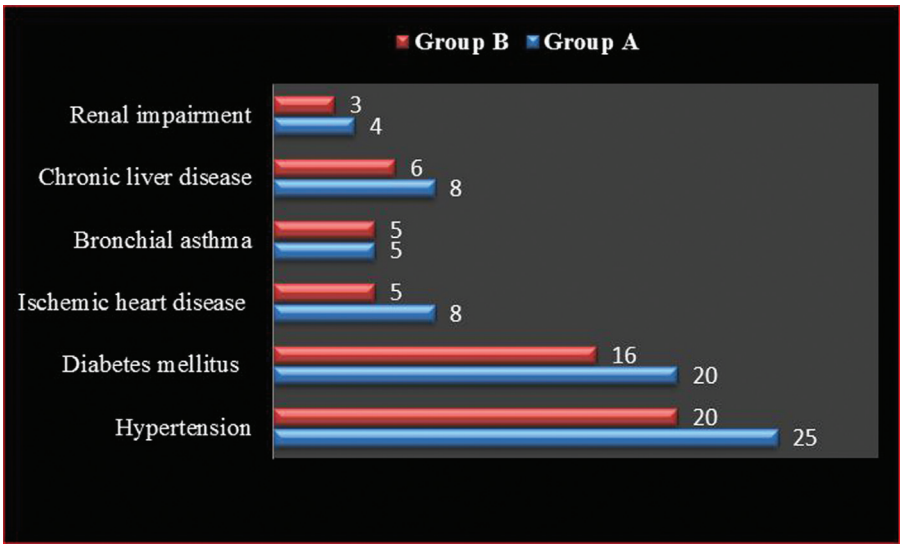
Data are presented as mean±SD and numbers; ranges and percentages are in parentheses. ASA, American Society of Anesthesiologists; D-LC, delayed laparoscopic cholecystectomy; SA-LC, same admission-laparoscopic cholecystectomy.

Figure 1



The sex distribution of patients in our study.

Figure 2



The distribution of chronic comorbidities in patients of our study.

Table 2 The preoperative laboratory and radiological data of the included patients

Data (NR)	Strata	SA-LC group (*n*=80)	D-LC group (*n*=70)	*P* value
Serum amylase (28–100 U/l)		105±83.6 (76–220)	98±75.6 (35–174)	0.518
AST (0–40 U/l)		26.5±12.5 (10–50)	25.4±13.2 (15–45)	0.332
ALT (0–41 U/l)		23.5±9.6 (15–45)	25.3±11.3 (17–50)	0.185
ALP (40–130 U/l)		70.3±31.5 (41–185)	68.7±42.1 (38–155)	0.169
Total bilirubin (<1.4 mg/dl)		1.65±0.62 (1–3.6)	1.5±0.8 (1–2.6)	0.198
Direct bilirubin (<0.2 mg/dl)		1.26±0.70 (0.3–1.8)	1.32±0.9 (0.1–1.5)	0.521
INR (0.8–1.1)		1.1±0.19 (0.9–1.6)	1.2±0.3 (1–1.5)	0.221
WBCs (4–11×10^9/l)		8.35±2.22 (6.8–13.4×10^9/l)	7.9±2.34 (6.7–12.3×10^9/l)	0.452
BUN (10–20 (mg/dl)		15.8±3.6 (7–29)	14.2±5.5 (9–22)	0.078
Radiology findings [*n* (%)]	Gallstones	80 (100)	70 (100)	
	CBD stones	0	0	
	CBD dilatation	4 (5)	2 (3)	0.065

Data are presented as mean±SD and numbers; ranges and percentages are in parentheses. ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BUN, blood urea nitrogen; CBD, common bile duct; D-LC, delayed laparoscopic cholecystectomy; INR, international normalized ratio; NR, normal range; SA-LC, same admission-laparoscopic cholecystectomy; WBC, white blood cells.

history were nearly comparable between both groups. Preoperative clinical and demographic data are summarized in Table 1 and Figs 1 and 2. We found that there are no significant differences between both groups with regard to the preoperative laboratory and radiological findings, as shown in Table 2.

The mainstream of patients in both groups passed the surgery easily without any intraoperative hazards. There were no significant differences between both groups with regard to the mean operative time (OT) (*P*=0.162); however, the mean OT was higher in the delayed elective group [SA-LC=48.12±10.44 (35–95) and D-LC=50.56±11.43 (25–100)], and this may be attributed to the dense gallbladder adhesions. As regards the biliary-related complications, there was no significant difference among both groups, and the frequency of bile leakage was 1/80 and 1/70 in group SA-LC and D-LC, respectively. Moreover, there was no significant difference between the two groups with regard to the conversion rate, intraoperative complications, rate of drain insertion, length of ICU admission, and the PO hospital stay days. This was mentioned clearly in Table 3.

Discussion

Worldwide, gallstone disease and its complications represent major surgical problems. Pancreatitis can occur due to the passage or impaction of an immigrant gallstone in the distal end of the CBD, and this disease is called biliary pancreatitis [14]. Management of acute attacks of biliary pancreatitis in most cases is conservative. However, after the

Table 3 Operative and postoperative data

Data	Strata	SA-LC group (*n*=80)	D-LC group (*n*=70)	*P* value
Operative time (min)		48.12±10.44 (35–95)	50.56±11.43 (25–100)	0.162
Intraoperative complications	Blood loss	70.00±10.65 (30–150)	65.50±20.35 (50–120)	0.311
	Biliary tract injury	0	0	
Technique of surgery	Three-port technique	74 (92.5)	62 (89)	0.420
	Four-port technique	6 (7.5)	8 (11)	0.322
	Conversion to open	3 (3.8)	3 (4)	0.231
Drain	*N* (%)	12 (15)	10 (14)	0.764
	Duration	1.52±2.8 (1–3)	1.63±2.1 (1–4)	0.268
PO complications[a]	Fever	4 (5)	3 (4)	0.261
	Bleeding	1 (1.25)	0	0.172
	Bile leakage	1 (1.25)	1 (1.5)	0.565
	Wound infection	3 (3.5)	3 (4)	0.431
	Total	9	7	0.186
PO ICU admission (days)		1.33±1.2 (1–3)	1.25±1.3 (1–4)	0.527
PO hospital stays (days)		2.21±1.52 (1–5)	2.36±1.41 (1–6)	0.125
Readmission in the waiting period (due to)	Biliary colic	0	7 (10)	0.036
	Acute cholecystitis	0	5 (7)	
	Recurrent pancreatitis	0	4 (5.5)	

Data are presented as mean±SD and numbers; ranges and percentages are in parentheses. D-LC, delayed laparoscopic cholecystectomy; PO, postoperative; SA-LC, same admission-laparoscopic cholecystectomy. [a]Some cases had more than one PO complication.

subsidence of an acute attack, the plan for removal of the gallbladder is mandatory to eradicate the source of this immigrant stone.

Nowadays, the international standard method for the management of gallstone disease is LC [15]. However, the debate has now been around the timing of LC, that is, whether it can be directly after the subsidence of the MABP attack or whether it can be delayed for 3 months after the disappearance of all the acute inflammatory reactions inside the abdomen.

Many preceding studies verified that SA-LC may be more technically challenging due to tissue edema and fragility that lead to the possible increase in the rate of conversion to open procedure and biliary tract injuries. The previous reasons may be considered as the cause that explains why many surgeons choose the delayed LC after MABP [14,16,17]. We found in this study that the rate of conversion to open cholecystectomy (COC) in SA-LC was 3/80 (3.8%) compared with 3/70 (4%) in the delayed elective LC. This is a low rate if compared with the studies carried out by Lyu *et al*. [18] and Aksoy *et al*. [19], who found in their two separate studies that the rate of COC was 7.3 and 7.2%, respectively, in the early LC group who underwent operations during the same hospital admission. They mentioned that the main reason for the high COC in the early LC group was obscure anatomy (including Calot's triangle); however, in the previous two studies, there were no observed significant differences in the rate of COC between the LC in the same admission and the delayed group [19]. On the reverse, a study done by Sinha agreed with our operative observations and found that the dissection of Calot's triangle was easier in the early LC group [14].

However, some types of LC complications may still occur, particularly in the operations carried out during the acute phase [20,21]. Several researchers trust that the SA-LC may raise the sternness of edema that is caused by pancreatitis [22]. In this study, we found that there was no significant rise in the rate of PO complications between LC in the same hospital admission and delayed LC group. The total number of PO complications in the SA-LC group was 9 versus 7 in the delayed group. Most of these complications were minor and did not affect the overall prognosis. This finding is in agreement with the Lyu *et al*. [18] study in which there was no significant difference in the complication rate between both groups. A recent review found that the rate of PO complications in the SA-LC group was lesser than that in the D-LC group [23]. On the contrary, a multicenter study concluded that early LC within 15 days of acute biliary pancreatitis could raise the rate of PO complications from 1 to 3% [24].

After LC, biliary-related complications such as CBD injury and bile leak are considered as the most important categories of PO complications that have an adverse influence on the overall survival and patient's quality of life [25,26]. There were no significant differences in our study between both groups with regard to the rate of biliary-related complications: it was 1/80 (1.25%) in SA-

LC group versus 1/70 (1.50%) in the D-LC group. Our results were nearly similar to the findings of the previous studies that have reported frequencies of biliary-related complications between 0.2 and 1.5% after LC [27,28]. On the contrary, the results of a study carried out by Johnstone *et al*. [16] revealed that the rate of CBD injury and bile leakage in the early LC group was double that associated with delayed LC.There was a concept that the indicator of the degree of difficulty in operation is the time of surgery; however, this study, and many of the previously mentioned studies, confirmed that the timing of LC after an attack of MABP did not affect the nature of the operation. In our study, there were no significant differences with regard to the OT, the length of PO hospital stay, or the PO ICU admission; however, only a limited number of studies delivered complete data with regard to the mean and SD of the length of hospital stay.

In this study, we found in the delayed LC group that the rate of readmission in the waiting period was 22.5%. The readmitted causes were biliary colic, 7/70 (10%); acute cholecystitis, 5/70 (7%); and recurrent pancreatitis, 4/70 (5.5%). By revision of the previous studies about the waiting period for a delayed elective LC after a long history of biliary pancreatitis, we noticed that all these studies mentioned high readmission rates ranging between 15 and 30%, and gallstone-related complications, including biliary colic (29%), acute cholecystitis (15%), and recurrent pancreatitis (8.5%) [8,10,29–32].

Conclusion

LC during the same hospital admission after an attack of MABP is a feasible and safe operation, and it can reduce the length of hospital stays, prevent the event of readmission due to gallstone-related complications, and does not raise the rate of PO complications.

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Conflicts of interest

There are no conflicts of interest.

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