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Original Article

Effects of prior abdominal surgery on laparoscopic cholecystectomy

Deniz Atasoy[1], Afag Aghayeva[1], İpek Sapcı[2], Onur Bayraktar[1], Turgut Bora Cengiz[2], Bilgi Baca[1]

ABSTRACT

Objectives: With increased experience and technological advancement, laparoscopic cholecystectomy is reported to be safe and feasible even in the presence of most of the previously recognized contraindications. The purpose of this study was to explore the effects of prior upper and lower abdominal surgery on laparoscopic cholecystectomy.

Material and Methods: A retrospective evaluation of all sequential patients who underwent laparoscopic cholecystectomy from January 2014 to June 2016 was conducted. Patients were divided into three groups (Group A: patients without any prior abdominal surgical procedures; Group B: patients with prior upper abdominal surgical procedures; and Group C: patients with prior lower abdominal surgical procedures).

Results: A total of 329 patients were assessed. Group A consisted of 223, Group B of 18, and Group C of 88 patients. A statistically significantly higher operative time, postoperative pain, and complication rate after laparoscopic cholecystectomy were noted in patients with prior upper abdominal surgery. The groups were comparable regarding patients' demographics and surgery indications. The length of hospital stay was not statistically different between the groups (p=0.065).

Conclusion: According to the results of the current study, prior upper abdominal surgery leads to a significantly longer procedure time, higher postoperative pain, and complication rates after laparoscopic cholecystectomy. However, the length of hospital stay was not affected by the parameters investigated.

Keywords: Cholecystectomy, cholelithiasis, laparoscopy, previous abdominal surgery

ORCID IDs of the authors:
D.A. 0000-0002-5703-4549;
A.A. 0000-0002-5317-8545;
İ.S. 0000-0002-1932-4254;
O.B. 0000-0003-2946-9569;
T.B.C. 0000-0002-9019-2979;
B.B. 0000-0003-1704-2533.

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[1]Department of General Surgery, Acıbadem University School of Medicine, İstanbul, Turkey

[2]Student, Acıbadem University School of Medicine, İstanbul, Turkey

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Corresponding Author
Deniz Atasoy
e-mail: datasoy@gmail.com

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INTRODUCTION

Laparoscopic cholecystectomy (LC) is considered to be the gold standard approach in the treatment of cholelithiasis (1-3). Laparoscopic cholecystectomy has certain advantages over the open cholecystectomy procedure, such as a shorter hospital stay (LOS), faster return to daily activities, and lower morbidity and mortality rates, both in symptomatic cholelithiasis and acute cholecystitis (1, 4-6).

As a result of new developments in laparoscopic instrument technology and improved laparoscopic experience of the surgeons, laparoscopy is continuing to evolve (2, 7). Initially, pregnancy, obesity, cirrhosis, and previous abdominal surgery were accepted as relative contraindications for LC (2, 3, 7-9). In addition, previous abdominal surgery is reported to increase the complication rate and prolong LOS after LC (10). In this study, we intended to examine the effects of prior upper and lower abdominal surgery on LC.

MATERIAL AND METHODS

Patients who experienced LC between January 2014 and June 2016 at a tertiary care clinic were included into this study. All elective and emergency cholecystectomies were included except robotic, single-port laparoscopic, and mini-LC procedures. The procedures were performed by the same surgeons with an average expertise duration of less than 10 years. Study data were retrieved from REDCap (11) and from the hospital records retrospectively. The study was approved by the institutional review board (approval no: 2016-13/7), and informed consent was signed by all patients.

Included patients were divided into three groups as follows: patients who did not have prior abdominal surgery (Group A), patients who had prior upper abdominal surgery (Group B), and patients who had prior lower abdominal surgery (Group C). Only patients in whom the location of previous surgery was in the abdomen, considering it might affect the LC procedure, were assigned to Groups B and C. Patients with prior surgery through a midline incision were included in Group B.

Three groups were compared regarding demographic data, procedure duration, operative blood loss, indication for surgery, postoperative pain, duration of hospital stay, and early (<30 days) complication rates. The postoperative pain grade was assessed by the Visual Analog Scale (VAS) on postoperative Day 1. Operative blood loss was measured by means of aspirated blood from the operation field. Bleeding that could not be detected in the aspirator's container or was less than 1 mL, was recorded as 1 mL.

All patients included into the study underwent a conventional four port (one 10 mm camera port and three 5 mm working ports) LC. In patients with a median incision scar, open technique was used to establish pneumoperitoneum. In rest of the patients, to obtain pneumoperitoneum, a Veress needle was used with blind technique. The specimen was extracted through the 10 mm umbilical trocar.

Statistical Analysis

The statistical analysis for group comparison was done using the Kruskal–Wallis test. The origin of statistical significance was assessed by the Mann–Whitney U test. Pearson's chi-squared test or Fisher's exact test were used for qualitative data (gender, indication for surgery, American Society of Anesthesiologists [ASA], complications) comparison between groups. The results are reported as mean±standard deviation and range. Statistical analyses were performed using the Epi Info software. $p<0.05$ was acknowledged as statistically significant.

RESULTS

A total of 329 patients that met the criteria were included into the study. Groups A, B, and C consisted of 223, 18, and 88 patients, respectively. Patient demographics and pre- and postoperative data are presented in Table 1.

The overall mean age was 48.3±15.4 (range, 17–90) years, the body mass index (BMI) was 28±5.09 (range, 17–49) kg/m^2, the operative time was 58±27.5 (range, 25–260) minutes, blood loss was 11.34±23.4 (range, 1–240) mL, the VAS score was 2.8±2.1 (range, 0–10), and postoperative LOS was 1.6±1.8 (range, 0–28) days. There was no mortality. Age, BMI, ASA score, incidence of acute cholecystitis, and LOS were comparable between the groups.

Group C had a significantly higher percentage of female (87.5%) patients than Group A (51.6%) and Group B (44.4%) ($p<0.001$). Group B showed a significantly longer mean operative time (72.22±38.4, 25–155 min) compared to Group A (58.76±28.14, 25–260 min) and Group C (52.94±21.74, 25–115 min) ($p=0.031$). The operative time was similar between Groups A and C.

The VAS score was statistically significantly higher in Group B (4.11±2.22, 0–10) than in Group A (2.8±2.05, 0–10) and Group C (2.44±2.11, 0–10). Group A had a significantly greater blood loss than Group C (13.02±26.12 mL vs. 5.98±7.92 mL, $p=0.003$).

There was no conversion to open except for one patient. This patient in Group B was operated on for a cholecystocutaneous fistula. The patient had a history of right nephrectomy and tube cholecystectomy performed due to a perforated gallbladder. His gallbladder was sclerotic, and a choledochal injury was noted intraoperatively. After conversion to open, a Roux-en-Y hepaticojejunostomy was executed. Patient was discharged home uneventfully.

Table 1. Patients' demographics and pre- and postoperative data

	Patients Without Any Previous Abdominal Operations (Group A, n=223)	Patients With Previous Upper Abdominal Operations (Group B, n=18)	Patients With Previous Lower Abdominal Operations (Group C, n=88)	p
Gender*				
Female	115 (51.6)	8 (44.4)	77 (87.5)	
Male	108 (48.4)	10 (55.6)	11 (12.5)	<0.001
Age# (years)	48.61±15.6	55.5±16.97	46.06±14.16	0.080
BMI# (kg/m^2)	28.26±5.08	27.72±5.22	27.48±5.09)	0.244
ASA*				
I	164 (74.9)	12 (66.7)	77 (87.5)	
II	47 (21.5)	6 (33.3)	9 (10.2)	
III	8 (3.7)	0	2 (2.3)	0.061
Operation time# (minutes)	58.76±28.14	72.22±38.40	52.94±21.74	0.031
Operation indication*				
Acute cholecystitis	75 (33.6)	4 (22.2)	31 (35.2)	
Elective cholelithiasis	148 (66.4)	14 (77.8)	57 (64.8)	0.563
Operative blood loss# (mL)	13.02±26.12	16.89±34.22	5.98±7.92	0.003
Postoperative VAS score#	2.8±2.05	4.11±2.22	2.44±2.11	0.010
Length of hospital stay# (day)	1.5±1.08	3.11±6.31	1.36±1.02	0.065
Conversion*	0	1 (5.6)	0	
Early (<30 day) complications*				
No	213 (96.4)	12 (75.0)	86 (97.7)	
Yes	8 (3.6)	4 (25.0)	2 (2.3)	0.004

Continuous variables are described as the mean±standard deviation (range), and categorical variables are described as n (%). Statistical significance is emphasized in bold.
BMI: body mass index, ASA: American Society of Anesthesiologists, VAS: Visual Analog Scale
Datas are presented as *; n (%), #; mean±SD

Short-term (<30days) complications were statistically higher in Group B (n=4, %25) (p=0.004). Except one, all were minor complications including seroma, hematoma, infection, and fat necrosis in the trocar site. One patient in Group B who had a history of open rectum cancer surgery had an iatrogenic bowel injury. During LC, widespread intra-abdominal adhesions were noted. On postoperative Day 2, he was diagnosed with iatrogenic small bowel injury. A loop ileostomy was created through laparotomy. The postoperative course was uneventful.

DISCUSSION

According to the results of this study, in patients who had prior upper abdominal surgery, operative time was longer, and the VAS scores and complication rates were higher compared with those who had earlier lower abdominal surgery and those who did not have any abdominal surgeries.

In the present study, the conversion rate in 223 patients without previous abdominal surgery was nil. When both the upper and lower abdominal surgery groups were combined, the conversion rate was 0.9% (n=1). In a study performed by Ercan et al. (8) in 2009, a total of 677 patients were divided into three groups. When the conversion rate was compared, 27.27% of patients with prior upper abdominal surgery (n=66), 2.82% of patients with lower abdominal surgery (n=567), and 25% of patients with both upper and lower abdominal surgeries (n=44) were converted to open. In a similar study, Akyurek et al. (7) showed that the overall conversion rate in 192 patients with prior abdominal surgery was 2%. This difference may be due to wider laparoscopic surgery experience and defined safe cholecystectomy methods together with improved laparoscopic surgical tools. In addition, our 5.6% conversion rate with one patient from the prior upper abdominal operation group is not sufficient to draw any statistical conclusions. However, studies vary in terms of conversion rates, complications, and LOS after LC in patients with previous abdominal surgeries. Unal et al. (12) reported that prior upper abdominal surgery was not a risk factor for conversion. On the other hand, Karayiannakis et al. (9) demonstrated higher complication and conversion rates and longer LOS (3.4±2.1 days) for patients with prior upper abdominal surgery than without prior upper abdominal surgery. In contrast to this study, our increased complication rate and operative time did not result in a prolonged LOS (3.11±6.31 days, p=0.065) for patients with prior upper abdominal surgery.

In the current study, although a trend toward an increased LOS in the group with prior upper abdominal surgery was observed, the difference was not statistically significant (p=0.065). When complication rates are compared, the upper abdominal surgery group showed a significantly higher complication rates (p=0.004). However, this difference did not affect the LOS. In our opinion, the reason may be due to the fact that except in two patients, all complications were minor.

It is proposed that prior abdominal surgery increases the risk of iatrogenic intestinal damage by causing adhesions or obstructing the visualization of hepatobiliary structures and limiting the working area (10).

Obtaining pneumoperitoneum by the open technique instead of the closed needle technique, might prevent complications in patients with median incisions. Adhesions and scar tissue were reported to restrict safe entrance into the abdomen and cause bowel and other intra-abdominal organ injury (10). In this study, although the first trocar was inserted with open technique, iatrogenic bowel injury was observed not during the trocar entrance, but later, after the operation, in Group B. This draws attention to more attentive manipulation of the laparoscopic tools during surgery. It has been reported that the possibility of bowel damage is higher during the first trocar entry in patients with prior abdominal surgery, and these injuries are noticed later because of limited visualization due to adhesions (8). Despite the accepted superiorities of LC compared with its open equivalent, conversion to open can be necessary in difficult cases to prevent inadvertent injuries (8). It should be noted that meticulous adhesiolysis is necessary to prevent iatrogenic injury.

The mean operative time was statistically significantly longer in Group B compared with Groups A and C (p=0.031). The time spent for open trocar insertion and time for adhesiolysis around the gallbladder could be the reasons for this statistically longer operative time in Group B. There was a significantly greater number of females in the lower abdominal surgery group (Group C) (87.5%). This was because lower abdominal procedures including Cesarean section, hysterectomy, and oophorectomy were specific for females. However, adhesions in this region did not adversely influence the LC operation time. Further studies are needed to investigate the contribution of duration of adhesiolysis and open technique to total operative time. Akyurek et al. (7) demonstrated that adhesions were the most common cause for conversion to open surgery. In the same study, however, it was documented that adhesiolysis itself did not result with complications.

A certain limitation of our study is that adhesions of the patients were not assessed according to a scoring system, and the time for adhesiolysis was not recorded separately.

Adhesiolysis may increase postoperative pain, operative blood loss, and LOS (9, 10). In this study, the mean VAS score was statistically significantly greater in Group B compared with Groups A and C (p=0.01). This difference could be attributed to the increased amount of adhesions and subsequent adhesiolysis needed in Group B. However, an increased VAS score and operative blood loss did not lead to a longer LOS.

When groups were compared concerning the operative blood loss, it was interesting to see that the blood loss was statistically significantly greater in Group A than in Group C. The method of our blood loss measurement might be the reason for this unexpected difference. During the study, we measured the operative blood loss by the amount of aspirated blood volume. We recorded the amounts of bleeding that did not need aspiration or less than 1 mL as 1 mL. Different measurement methods may clarify this inconsistency.

We would like to acknowledge some limitations of our study. First, it was a retrospective analysis with inherent limitations. Thus, selection bias could not be prevented. Second, the sample size of the group with previous upper abdominal surgery

was small. Third, the adhesion scoring system was not used, or time for adhesiolysis and for open trocar insertion was not calculated separately from the total operation time. Finally, this study is also limited in its generalizability because the study population were patients who presented to a tertiary care center.

Additional studies are required to define the role of adhesiolysis. In addition, studies including a higher number of patients with prior upper abdominal procedures may further explain these concerns.

CONCLUSION

Prior upper abdominal surgery results in a lengthier operative time, higher postoperative pain, and greater complication rates after LC, compared to patients with earlier lower abdominal surgery and without earlier abdominal surgery. However, in this study, previous abdominal surgeries did not increase LOS and the conversion rate after LC. Further studies that would include patients with a higher number of prior abdominal procedures are needed.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Acibadem University School of Medicine (2016-13/7).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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