

Laparoscopic Cholecystectomy in Patients With History of Gastrectomy

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ABSTRACT

Background and Objectives: Patients with previous gastrectomy have an increased incidence of gallstones and gallbladder morbidity requiring surgery. We investigated the possible risk factors that contribute to severe gallbladder disease in patients with previous gastrectomy and the role of laparoscopic cholecystectomy (LC) in the treatment of these patients.

Methods: In this retrospective study, we reviewed a database of patients who underwent LC in our hospital during the period January 1, 2010, through May 1, 2015.

Results: The average operation time in patients with previous gastrectomy was longer ($P < .05$), but the operation times of patients with a long interval (>5 years) between gastrectomy and LC showed no statistical difference from those of patients without a history of gastrectomy ($P > .05$). The conversion rate did not differ between the 2 groups ($P > .05$), but in patients with previous gastrectomy, the conversion rate was significantly reduced after we adopted a comprehensive preoperative evaluation procedure ($P < .05$). The frequency of cholecystitis attacks, rate of combination with gallbladder polyps, and rate of combination with pancreatitis were higher and gallstone formation time shorter, in the patients with malignant tumor, those undergoing Billroth II gastroenterostomy or esophagojejunostomy, and those with accompanying diabetes mellitus or hypercholesterolemia ($P < .05$).

Conclusion: LC plays an important role in the treatment of benign gallbladder diseases in patients with a history of gastrectomy, and a comprehensive preoperative evaluation and accomplished surgical technique are necessary for successful outcomes. Previously identified clinical features may represent a risk factor for severe cholecystic morbidity in these patients.

Key Words: Gallbladder disease, Gastrectomy, Laparoscopic cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy (LC) has gained widespread clinical acceptance as a safe and effective technique for the treatment of benign gallbladder diseases that offers rapid postoperative recovery.¹⁻³ However, previous upper abdominal surgery has been reported as a relative contraindication to LC^{4,5} because of anticipated adhesions around the abdominal wall, Calot's triangle, and its surrounding organs, which may increase the risk of organ injury associated with the dissection of adhesions. On the other hand, patients with previous gastrectomy have an increased incidence of cholelithiasis and increased morbidity requiring cholecystectomy.^{6,7} In this retrospective study, therefore, we investigated the role of LC in the treatment of cholelithiasis and the possible risk factors that contribute to severe cholecystic morbidity requiring cholecystectomy in patients with previous gastrectomy.

MATERIALS AND METHODS

Patients and Methods

The clinical data of 1022 patients who underwent LC in our hospital from January 1, 2010, through May 1, 2015, were reviewed retrospectively. Patients were aged between 23 and 81 years (mean, 58.0; median, 47). There were 312 men (30.5%) and 710 women (69.5%) with a male-to-female ratio of 0.439:1. No gallbladder cancer was identified. A total of 127 patients (12.4%) comprising 93 men (73.2%) and 34 women (26.8%) (male-to-

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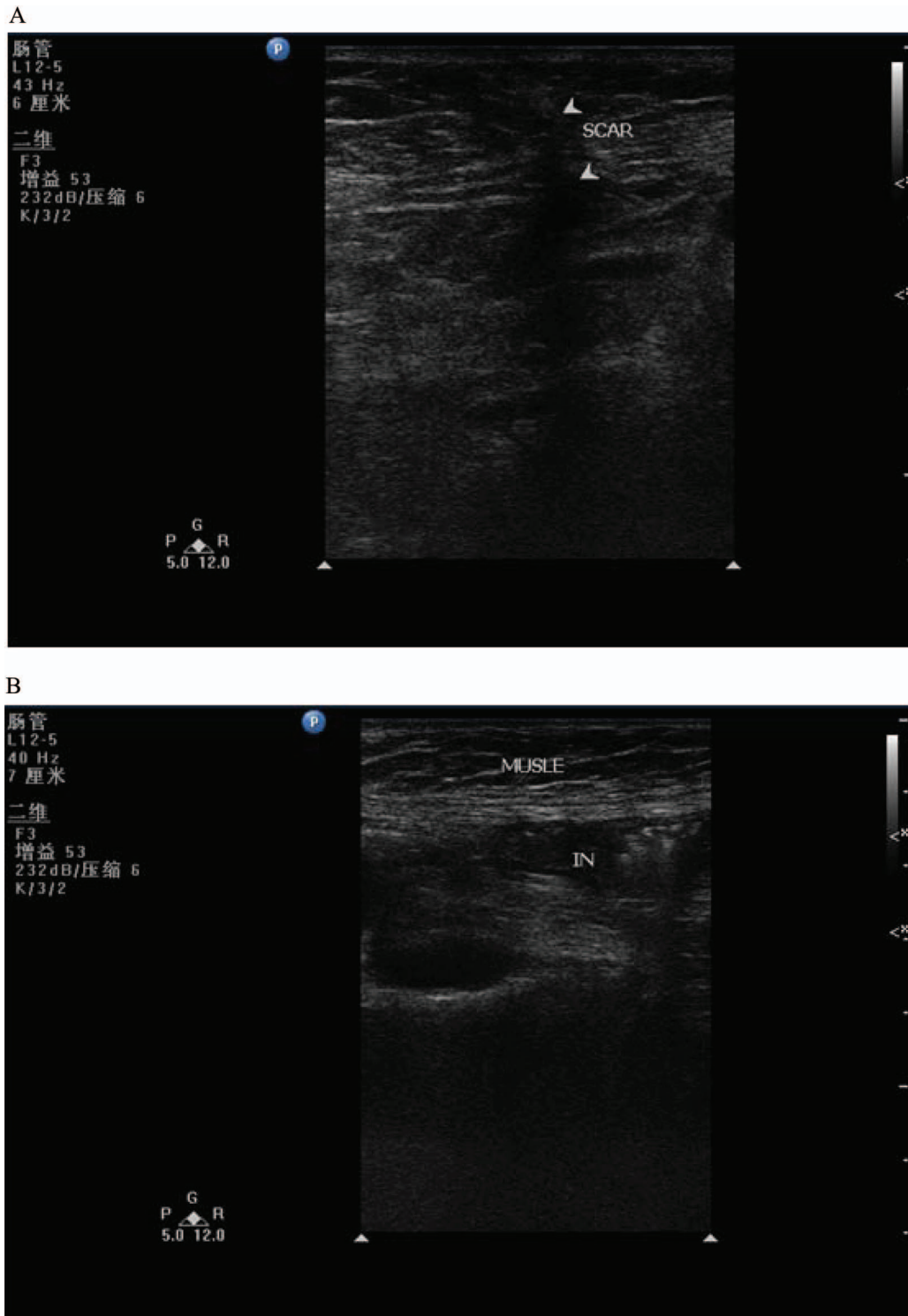


Figure 1. Ultrasonograms. **A**, Evaluation of adhesions at the original gastrectomy incision site by preoperative ultrasonography. **B**, Movement distance of intestine (IN) under the abdominal wall under easy breathing. **C, D**, Distance from the position of insertion of the initial trocar to the superior mesenteric vein (SMV) and aorta (AO).

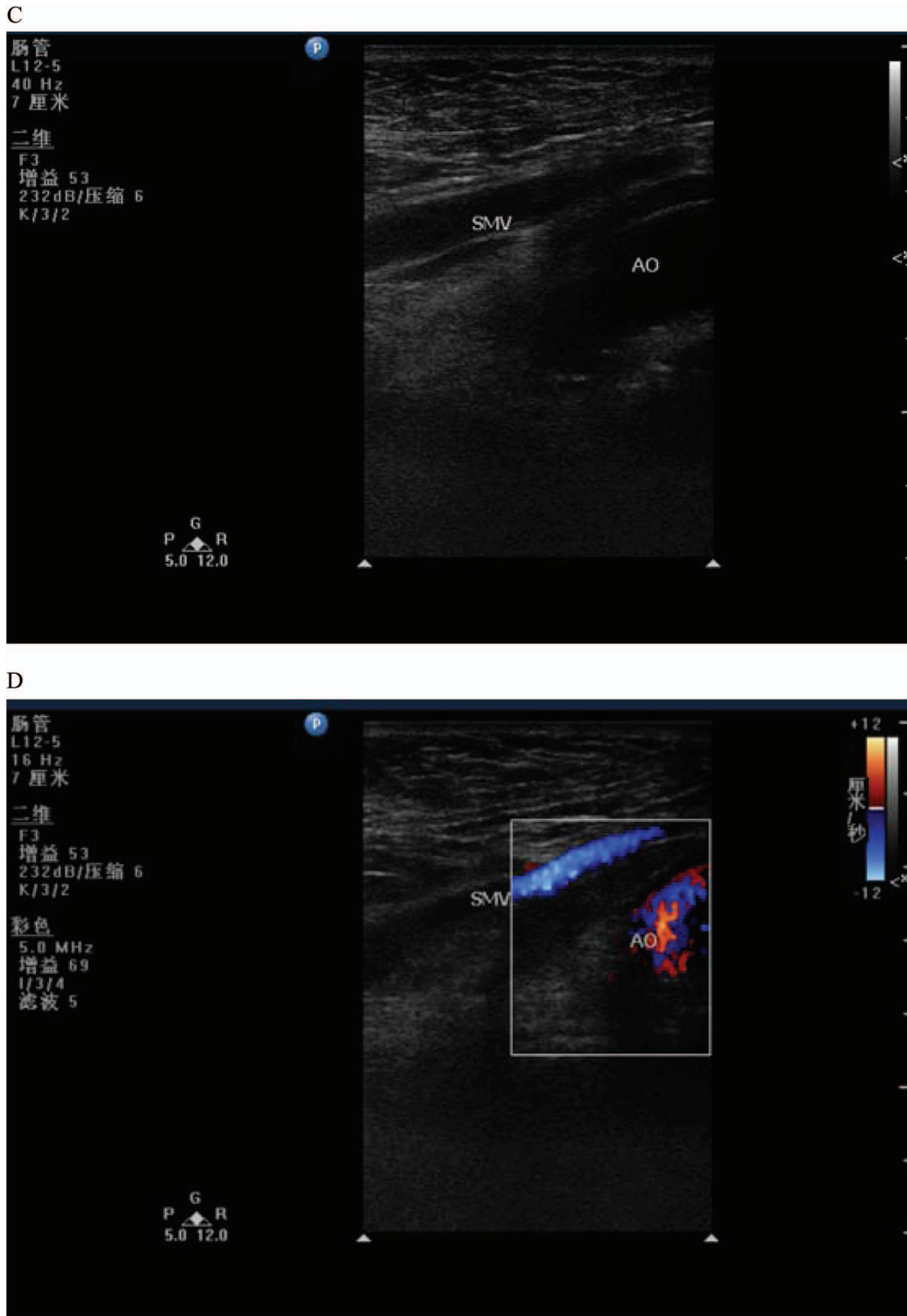


Figure 1. Continued

Table 1.
Patient Characteristics

Characteristic	No Gastrectomy History (n = 895)	Gastrectomy History (n = 127)	P
Age (years) (mean ± SD)	50.23 ± 10.2	68.45 ± 9.5	<.05
Male, n (%)	312 (30.5)	93 (73.2)	<.05
Combined with CBD stones, n (%)	116 (11.7)	41 (32.3)	<.05

CBD, common bile duct.

female ratio 2.735:1) had undergone previous gastrectomy for gastric cancer (n = 109) and gastroduodenal ulcer (n = 18). The median interval from the time of previous surgery was 8 years (range, 2–32 years). There were 54 patients with gallstones, 12 with gallbladder polyps, and 61 with gallstones combined with gallbladder polyps. Of 41 patients with common bile duct (CBD) stones, 12 underwent endoscopic sphincterotomy (EST) to remove the stones in the preoperative period, and 29 patients underwent 1-stage laparoscopic common bile duct exploration (LCBDE) with LC. The types of previous gastrectomy were distal gastrectomy in 82 patients and total gastrectomy in 45. Analysis of variance was used to compare operation time, blood loss, conversion rate, intraoperative CBD injury rate, diet resumption, and length of postoperative hospital stay between the patients with and without a history of gastrectomy. Analysis of variance of previous gastrectomy was used to compare the severity of gallbladder disease in the postoperative period.

Surgical Procedures in Patients with a History of Gastrectomy

All patients received general anesthesia, and a standard 4-trocar technique was used. Successful insertion of the initial trocar is the first and most important step in performing LC in patients with previous gastrectomy. Using preoperative ultrasonography, we evaluate the adhesions at the original gastrectomy incision site (**Figure 1A**), the distance moved by the intestine under the abdominal wall under easy breathing (**Figure 1B**), and the distance from the position of insertion of the initial trocar to the superior mesenteric vein (SMV) and aorta (AO) (**Figure 1C, D**). When the adhesions at the original gastrectomy incision site are severe, we prefer to choose the site just right of the umbilicus, 3 cm from the original gastrectomy incision. When preoperative ultrasonography shows lateral movement of the intestine of less than 1 cm and longitudinal movement of less than

Table 2.
Adhesion Characteristics of the Patients With a History of Gastrectomy

Characteristic, n (%)	Data
Adhesions to the abdominal wall (n = 32)	
Interval between gastrectomy and LC <5 years	27 (84.4)*
Interval between gastrectomy and LC >5 years	5 (15.6)
Organs adhering to gallbladder (n = 127)	
Greater omentum	52 (40.9)
Duodenum	47 (37.0)
Colon	18 (14.2)
Small intestine	10 (7.9)

LC, laparoscopic cholecystectomy.

**P* < .05.

3 cm under easy breathing, we anticipate that the adhesions are severe,⁸ so safe peritoneal access (i.e., open the peritoneum under direct vision through a small incision) is applied to these patients. When organs such as the duodenum, small intestine, or colon adhere to the gallbladder or Calot's triangle, a safe dissection technique, such as dissecting the serosa of the gallbladder to prevent injury to these organs or using suction to push and suck to separate the adhesions around the Calot triangle, is performed. Because of translocation of the CBD resulting from adhesions after gastrectomy, we divided the cystic duct until the common hepatic duct and CBD were clearly identified.

Statistical Analysis

All statistical analyses were conducted with SPSS software (version 19.0 for Windows; IBM, Armonk, New York, USA). Continuous variables were summarized by calculat-

Table 3.
Details of Gallbladder Disease in Patients With History of Gastrectomy

Patient Characteristics	Cholecystitis Episode Frequency (per Month) (Mean ± SD)	Gallstone Formation Time (Months) (Mean ± SD)	Gallbladder Polyp Combination Rate, n (%) (61/127)	Pancreatitis Combination Rate, n (%) (45/127)
Sex				
Male (n = 93)	2.33 ± 1.5	7.34 ± 5.2	45 (48.3)	32 (34.4)
Female (n = 34)	2.57 ± 2.1	8.01 ± 4.3	16 (47.1)	13 (38.2)
Age (years)				
<65 (n = 32)	2.58 ± 2.9	8.15 ± 4.7	18 (56.3)	12 (37.5)
≥65 (n = 95)	2.21 ± 1.7	7.03 ± 4.9	43 (45.3)	33 (34.7)
Method of reconstruction				
Billroth I (n = 38)	0.97 ± 4.9	10.91 ± 3.7	4 (10.5)	3 (7.9)
Billroth II or Roux-en-Y (n = 99)	3.73 ± 2.5*	4.22 ± 2.9*	57 (57.6)*	42 (42.4)*
Pathology of disease				
Benign (n = 18)	1.01 ± 3.6	12.15 ± 3.5	2 (11.1)	1 (5.5)
Malignant (n = 109)	3.77 ± 4.4*	3.04 ± 1.4*	59 (54.1)	44 (40.4)*
Diabetes mellitus				
Yes (n = 80)	4.26 ± 1.2	3.33 ± 1.7	55 (68.8)	43 (53.8)
No (n = 47)	0.52 ± 3.4*	11.76 ± 4.2*	6 (12.8)*	2 (4.3)*
Hypercholesterolemia				
Yes (n = 78)	3.34 ± 2.6	4.11 ± 2.1	54 (69.2)	40 (51.3)
No (n = 49)	1.24 ± 3.2*	10.55 ± 2.2*	7 (14.3)*	5 (10.2)*

**P* < .05.

Table 4.
Operative Details and Clinical Outcomes

Operative Details	No Gastrectomy History (n = 895)	Gastrectomy History (n = 127)	<i>P</i>
Operation time (min)	51.4 ± 22.7	84.6 ± 20.5	<.05
Blood loss (mL)	25.4 ± 6.4	27.3 ± 7.5	>.05
Conversion rate, n (%)	28 (3.1)	6 (4.7)	>.05
Intraoperative bile duct injury rate, n (%)	12 (1.3)	2 (1.6)	>.05
Diet resumption (days)	1.1 ± 0.5	1.2 ± 0.6	>.05
Postoperative hospital stay (days)	3.2 ± 2.2	3.4 ± 1.9	>.05

Data are the mean ± SD unless otherwise noted.

ing means and standard deviations, whereas frequencies and percentages were used for categorical variables. Student's *t* test and Fisher's exact test were used for quantitative data. Pearson's correlation test was used for correlation analysis. Values of *P* < 0.05 were considered to be statistically significant.

RESULTS

Patients' Characteristics

The mean age and the incidence of CBD stones were higher in patients with a history of gastrectomy (*P* < .05),

Table 5.
Operation Times for Different Intervals

	Interval Between Gastrectomy and LC <5 Years (n = 80)	Interval Between Gastrectomy and LC >5 Years (n = 47)	No Gastrectomy History (n = 895)
Operation time (min)	89.6 ± 25.7	61.3 ± 21.2*	51.4 ± 22.7 [†]

* $P < .05$: patients with interval of more than 5 years between 2 operations, whose operation time was less than the patients whose interval was less than 5 years.

[†] $P > .05$: patients with interval of more than 5 years between 2 operations, whose operation time is not different from that of patients without previous gastrectomy.

and previous gastrectomy was more common in men, as shown in **Table 1**.

Operative Details

Adhesions to the gallbladder were found in all patients with a history of gastrectomy, but adhesions to the abdominal wall were found in only 32 (25.2%) patients. Patients with an interval between gastrectomy and LC of more than 5 years had a lower incidence of adhesions to the abdominal wall ($P < .05$). Organs adhering to the gallbladder included the greater omentum (52, 40.9%), duodenum (47, 37.0%), colon (18, 14.2%), and small intestine (10, 7.9%), as shown in **Table 2**.

Details of Gallbladder Disease in Patients with a History of Gastrectomy

The frequency of cholecystitis attacks and the rates of combination with gallbladder polyp and pancreatitis, were higher, and gallstone formation time shorter, in patients with malignant tumor, those who had undergone Billroth II gastroenterostomy or esophagojejunostomy, and those with accompanying diabetes mellitus or hypercholesterolemia ($P < .05$). There was no significant difference in age and sex (**Table 3**).

Clinical Outcomes

The average operative time in patients with previous gastrectomy was longer ($P < .05$), as shown in **Table 4**. The operative time for patients with a long interval (>5 y) between gastrectomy and LC showed no statistically significant difference from that for patients without a gastrectomy history ($P > .05$), but was significantly shorter than that for patients whose interval was less than 5 years ($P < .05$), as shown in **Table 5**. There were no significant differences between the two groups with regard to blood loss, conversion rate, intraoperative CBD injury rate, diet resumption, and postoperative hospital stay ($P > .05$) (**Table 4**). The conversion rate during the early period of

Table 6.

Conversion Rate During Different Periods of Administering LC in Patients With Previous Gastrectomy

Rate	Early period (2010.1-2011.11)	Later period (2011.12-2015.5)	<i>P</i>
Conversion rate (%)	19.2 (5/26)	1.0 (1/101)	<.05

performing LC in patients with previous gastrectomy was higher than that during the later period ($P < .05$), as shown in **Table 6**.

DISCUSSION

It is widely accepted that the incidence of gallstone formation after gastrectomy is higher than that in the population without surgical history, ranging from 13 to 22%.⁹ Mechanisms for these observations remain unclear. According to the literature, when a patient undergoes gastrectomy, damage to the hepatic branch of the vagus nerve and gastric reconstruction that reduces the passage of food through the duodenum are unavoidable, leading to abnormal secretion of cholecystokinin and a probable decrease in gallbladder motility, and, ultimately, gallstone formation.¹⁰⁻¹³

Previous upper abdominal surgery, especially gastrectomy, has been considered a relative contraindication for LC. Laparoscopic surgery failures in patients with previous gastrectomy were attributable to adhesions, such as around the position of initial trocar insertion and in proximity to the gallbladder and CBD.¹⁴ These adhesions harbor the risk of injury to the adhesive organs and lead to the necessity for open surgery. According to the literature, the conversion rate of LC in patients with previous gastrectomy ranged from 7.7 to 50%.¹⁵ In our series, we encountered a low conversion rate of 4.7%. During the early period of performing LC in patients with a history of gastrectomy, the operation in 1 patient in our series was

Table 7.
Preoperative Evaluation to Anticipate Severity Level of Intra-abdominal Adhesions

Evaluation	Score (points)	
Hyperplasia of original incision	No (0)	Yes (1)
Postoperative intestinal obstruction	No (0)	Yes (1)
Abdominal infection	No (0)	Yes (1)
Methods of gastroenterostomy	Billroth I (0)	Billroth II or Roux-en-Y (1)
Preoperative ultrasonography test	Lateral MD >1 cm (0)	Lateral MD <1 cm (2)
	Longitudinal MD >3 cm (0)	Longitudinal MD <3 cm (2)

MD, movement distance.

converted to open surgery because, at the preoperative evaluation, we lost the information concerning the anastomotic leakage that occurred during the previous operation. As in such patients adhesions in the abdomen can be very severe and dense, insertion of the initial trocar failed and injured the colon, forcing us to perform open surgery. After this case, we adopted a preoperative evaluation procedure that anticipates the severity level of the intra-abdominal adhesions by assessing factors including hyperplasia of the original incision, postoperative intestinal obstruction, method of gastroenterostomy, abdominal infection,⁴ and preoperative ultrasonography. Throughout the procedure, we obtained a score to anticipate the severity level of the intra-abdominal adhesions, as shown in **Table 7**. When the score was more than 3 points, extensive intra-abdominal adhesions were suspected, and safe peritoneal access (i.e., the peritoneum is opened under direct vision through a small incision) was recommended.¹⁶ As the technique of safe peritoneal access is not difficult, comprehensive and accurate preoperative evaluation of adhesion severity confers an important benefit in reducing the conversion rate. After we adopted this preoperative evaluation procedure the conversion rate decreased, as shown in **Table 6**. With respect to dealing with adhesions around the gallbladder, we suggest dissecting the serosa of the gallbladder to prevent injury to the adhering organs.¹⁷ Our method consists in using an electrocoagulation hook to dissect the adhesion line, followed by the use of suction to push and suck and thus separate the adhesions around Calot's triangle, which helps to avoid injuring the bile duct.

In the present, study we found that the average operative time in patients with a history of gastrectomy was longer, but also that patients with a long interval between gastrectomy and LC have an operation time similar to that of those without surgical history and less than that for those

with a short interval; moreover, the incidence of adhesions to the abdominal wall was lower among patients with a long interval between operations. In other words, a longer interval between operations is related to fewer intra-abdominal adhesions and a more efficient LC procedure. Therefore, our first option for patients requiring treatment of cholecystic morbidity more than 5 years after initial surgery would be LC. We also found that frequency of cholecystitis attacks and rates of combination with gallbladder polyp and pancreatitis were higher, whereas gallstone formation time was shorter in patients with malignant tumor, those who had undergone Billroth II gastroenterostomy or esophagojejunostomy, and those with accompanying diabetes mellitus or hypercholesterolemia. These results suggest the initiation of aggressive treatment of cholecystic morbidity during the postgastrectomy period in patients with the aforementioned risk factors. We also observed no significant differences between our 2 groups with regard to conversion rate and intraoperative and postoperative outcomes, demonstrating that LC is a viable therapeutic choice for the treatment of gallbladder disease in patients with a history of gastrectomy, although comprehensive preoperative evaluation and the skill of the surgeon are necessary requirements for efficacious results.

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