Concomitant cholecystectomy during laparoscopic sleeve gastrectomy through the same four ports: feasibility and early results

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Received: 31 December 2020
Revised: 14 January 2021
Accepted: 31 January 2021
Published: 12 October 2021

The Egyptian Journal of Surgery 2021, 40:509–514

Background
Up till now, the ideal therapeutic approach of cholelithiasis at the time of laparoscopic sleeve gastrectomy (LSG) is a matter of debate. The aim of this study was to report our experience regarding concomitant cholecystectomy (CC) during LSG through the same four ports.
Patients and methods
From January 2016 to February 2020, 70 morbidly obese patients were subjected to LSG, as the primary bariatric procedure, and CC for documented gallbladder pathology (study group), and they were compared with 384 morbidly obese patients subjected to just LSG (control group). This study discussed the preoperative patients' demographics, preoperative comorbidities, operative technique, operative time, early and late complications, excess weight loss results, and assessment of postoperative pain. There was no significant statistical difference regarding age and preoperative BMI between both groups; however, the study group had more female predominance.
Results
All procedures were done laparoscopically through the same four ports without any additional trocars and no conversions. The main operative time extended by a mean of 25.81±7.59 min (range, 15–45 min) owing to CC, in the study group. There was no statistical difference regarding 24-h postoperative pain, morbidity rate, mean percentage of excess weight loss, and the mean length of hospital stay between both groups.
Conclusions
CC during LSG is feasible through the same ports, safe, and not associated with increased morbidity rate nor prolonged hospital stay; however, the operative time is prolonged. CC is better offered for morbidly obese patients with proven gallbladder disease, weather they are symptomatic or not, to avoid future complications.

Keywords:
bariatric, concomitant cholecystectomy, obesity, sleeve gastrectomy

Egyptian J Surgery 40:509–514

1110-1121

Introduction

The incidence of cholelithiasis is high among obese populations [1]. Moreover, up to one-third of morbidly obese patients are at risk of gallstone formation after weight reduction surgery [2–4]. Several mechanisms have been proposed to explain why rapid weight loss following bariatric surgery promotes gallstone formation. Of these, the most important is alteration of gallbladder (GB) bile composition with increased cholesterol saturation and mucin concentration [5]. Although most patients are asymptomatic, it was founded that the risk of symptomatic gallstone disease after bariatric surgery increases up to a fivefold compared with that in the general population [6]. Different management options of the GB stones in bariatric patients have been proposed: prophylactic concomitant cholecystectomy (CC) for all patients, selective CC applied in the presence of GB pathologies, and delayed conventional cholecystectomy applied when both gallstones and symptoms develop after the bariatric surgery [5]. Currently, the ideal therapeutic approach is a matter of debate. The aim of our study was to report our experience in CC through the same ports of laparoscopic sleeve gastrectomy (LSG) in morbid obese patients with documented GB pathology even if they were asymptomatic, taking in consideration feasibility, safety, and postoperative pain assessment.

Patients and methods

This prospective study was carried out during the period from January 2016 to February 2020 at General Surgery Department, Tanta University Hospitals. Inclusion criteria included morbidly obese patients having a BMI more than or equal to 40 kg/m^2, or more than 35 kg/m^2 with at least one obesity-related comorbidity together with ultrasound-(US) documented GB stones, sludge, or polyps either symptomatic or not. Exclusion criteria included patients with a history of a previous bariatric procedure, patients with previous cholecystectomy, patients with symptoms suggesting GERD, and patients having psychiatric disorder. An informed written consent was obtained from each patient included in this study after discussion of the operative details and possible complications. Patients subjected to combined LSG and cholecystectomy represented the study group, whereas those subjected to just LSG were the control group. The study protocol was approved by the Research Ethical Committee. All procedures were performed by the same surgeons (authors). This study discussed the preoperative patients' demographic features, preoperative comorbidities, operative technique, operative time, early and late complications, weight loss results, and assessment of postoperative pain using visual analog scale (VAS). All patients were advised to follow-up in our center at 1 week, 1, 3, 6, 12 months, and yearly thereafter.

Statistical analysis

Data were collected and statistical analyses were done using IBM SPSS software package, version 20 (IBM, Armonk, New York, USA). Qualitative data were expressed as frequency and percentage. Quantitative data were expressed as range, mean, and SD. The χ^2 test of significance was used to compare proportions between two qualitative parameters. The independent *t* test was used to compare between two means. *P* values less than 0.05 were considered statistically significant.

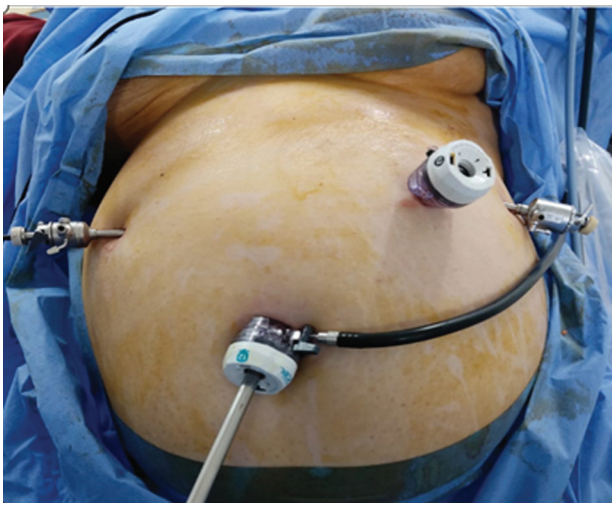
Preoperative considerations

Routine preoperative abdominal US was done for all cases. Prophylactic third-generation cephalosporin antibiotic was given intravenously at the induction of anesthesia. All patients received low-molecular-weight heparin (Clexane) 40 IU night of the procedure for prophylaxis against thromboembolism.

Operative technique

General anesthesia was given. All patients were placed on the operation table in the supine position with both legs apart (French position) and 45° reverse Trendelenburg. The laparoscopic set was placed on the patient's right, beside the head. The surgeon stood in-between the patient's legs, the camera man stood on the patient's right, whereas the assistant stood on the patient's left. Four trocars were used: two 12 mm port and two 5 mm port (Fig. 1). The first 12 mm port (Endopath Xcel optiview trocar) was inserted under direct vision through the umbilicus at its upper border for the 30° optical system. The abdominal cavity was inspected, and then the second 12-mm trocar was inserted 5–7 cm below the left costal margin on the midclavicular line (surgeon's right hand). The first 5-mm trocar was inserted 5–7 cm below the right costal margin on the midclavicular line (surgeon's left hand), and the second 5-mm trocar was inserted 3 cm below the left costal margin on the anterior axillary line (assistant). All of our cases in this study group underwent cholecystectomy after sleeve gastrectomy. LSG started by greater curvature mobilization from the pylorus up to angle of His using harmonic scalpel (Ethicon Endo-Surgery Inc., Johnson and Johnson, Cincinnati, Ohio, USA). The gastric tube was created over a 36-F bougie starting 5 cm proximal to pylorus using multiple firings, (average, 4–6) of articulating linear stapler (Echelon Flex Endopath, Ethicon Endo-Surgery Inc., Johnson and Johnson). The first stapler firing was done through the umbilical port while the following firing through the left 12-mm port. Liver retraction during greater curvature mobilization was achieved indirectly by left hand of surgeon elevating the gastric wall anteriorly, thus elevating the left lobe of the liver simultaneously. During stapling, liver retraction was achieved directly by left hand of the surgeon (Fig. 2). After complete gastric division, staple line was inspected carefully for any bleeding points, which were controlled by clipping. Cholecystectomy was then

Figure 1



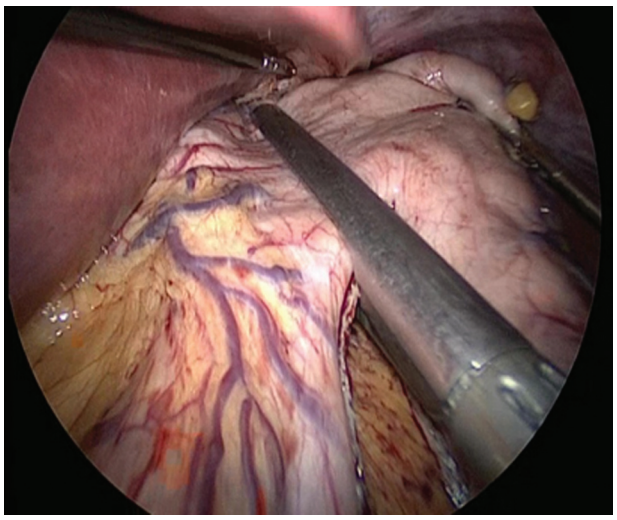
Port positions.

performed through the same four ports. The assistant's grasper crossed under the lower border of the falciform ligament to grasp GB fundus retracting it upward, whereas a toothed grasper was introduced through the right port (surgeon's left hand) retracting the Hartman pouch laterally (Fig. 3). With the aid of harmonic scalpel, dissection of anterior and posterior leaflets of the Calot triangle was done identifying the cystic duct and artery (Fig. 4). The artery was divided by the harmonic, whereas the duct was clipped and divided by scissor. The GB was dissected completely by the aid of harmonic shear. Finally, extraction of both gastric and GB specimens through the left 12 mm port was done by the aid of Kocher forceps after muscle splitting (Fig. 5). A drain was placed routinely near the upper part of gastric sleeve through left 5-mm port, whereas no drain was put in the GB bed except if ruptured GB during dissection (two cases).

Postoperative

(1) Oral clear fluid was introduced 12 h postoperatively and continued for the first postoperative week to be followed by full liquid diet. The drains were removed in the second postoperative day once no early postoperative mishaps occurred. Prophylactic single daily dose of low-molecular-weight heparin was prescribed for all patients up to 2 weeks postoperatively, whereas proton pump inhibitors were prescribed for the first 2 months postoperatively.

Figure 2

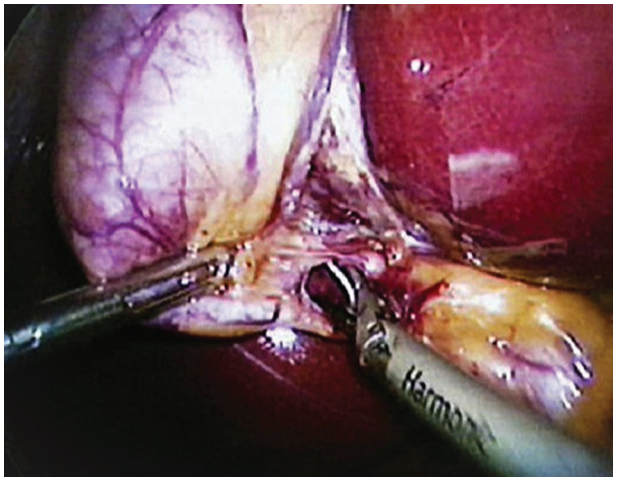


Liver retraction during gastric stapling.

Figure 3

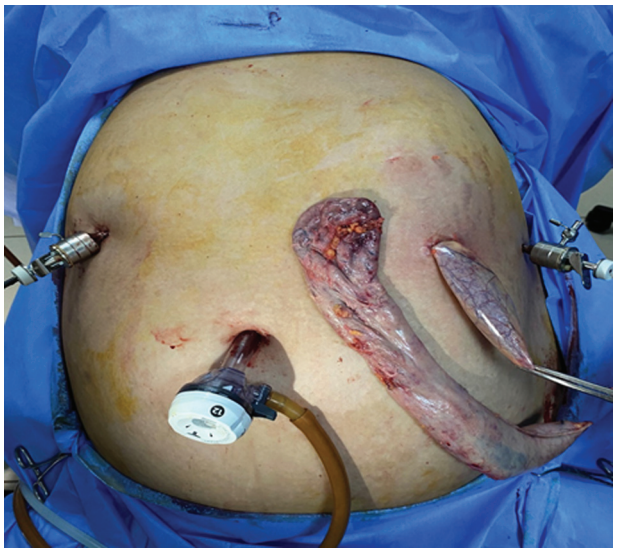
GB fundal upward retraction and lateral retraction of the Hartman pouch. GB, gallbladder.

Figure 4



Cystic duct and artery identification by the aid of harmonic.

Figure 5



Extraction of the gastric and GB specimen. GB, gallbladder.

Results

A total of 492 patients were subjected to LSG through four-port technique in our center during the study period. Overall, 28 (5.7%) of them had a previous cholecystectomy and were excluded. In addition, 10 (2.03%) patients required additional port insertion and were also excluded. Moreover, 70 patients had a GB disease (sixty five GB stones, three GB sludge, and two GB polyps less than 1 cm) on preoperative US screening and were subjected to CC during LSG and were the study group. The remaining 384 patients had normal biliary US image and subjected to LSG only and were the control group. There was no significant statistical difference regarding mean age and preoperative BMI between the two groups; however, more female distribution ratio was seen in the study group than the control group (87.1 vs. 70.3%, respectively). Regarding comorbidities distribution, hyperlipidemia was significantly distributed within the study group (P=0.004). Patients' demographics are illustrated in Table 1.

Operative records and hospital stay

All procedures were done laparoscopically through the same four ports without any additional trocars. Regarding the operative time for the study group, the mean operative time for both LSG and cholecystectomy was 76.82±17.22 min (range, 65–120 min), the mean operative time of LSG was 51.01±18.38 min (range, 38–100 min), whereas the mean time for cholecystectomy alone was 25.81 ±7.59 min (range, 15–45 min). Regarding the control group, the mean operative time was 52.75±14.93 min (range, 35–105 min). GB ruptured during dissection from liver bed in two patients. Irrigation and suction was done in the surgical field followed by insertion of drain in the right subhepatic space. The mean length of hospital stay was 1.76±0.05 day (range, 1–7 day) and 1.41±1.66 day (range, 1–21 day) in the study and control groups, respectively, with no statistical significance (P=0.081).

Postoperative pain

Assessment of 24-h postoperative pain between the study and control groups using VAS revealed a mean score of 3.65±1.42 and 3.42±1.32, respectively, with no statistically significant difference (P=0.186).

Morbidity and mortality

There was no mortality in our patients. Staple line leakage was detected in the third day postoperative day in one patient in the control group (0.26%) and was managed successfully by endoscopic stenting. Postoperative bleeding occurred in one (1.4%) patient in the study group and was in the form of recurrent attacks of melena associated with vital sign deterioration and drop of hemoglobin levels although conservative measures necessitating endoscopic examination that revealed intraluminal staple line bleeding and was managed successfully by epinephrine injection with thermal coagulation. Nine (2.3%) patients in the control group had postoperative bleeding that was evident through the drainage volume (> 100 ml/h). Conservative measures in the form of intravenous fluid and blood transfusion were beneficial in five of them, whereas diagnostic laparoscopy was essential in four patients after failure of conservative management. On laparoscopy, saline irrigation and suction was necessary to identify the source of bleeding (the staple line in three patients and short gastric vessels in one patient). The bleeding was controlled by under running sutures of the staple line at the bleeding points and clipping of the affected short gastric vessel. The overall morbidity rates were similar in both groups, with no statistically significant difference (P=0.745). Cholecystectomy was not associated with specific complications in the study group except in one patient who presented with fever and right hypochondrial pain on the third day postoperatively. US examination revealed collection at GB bed and was managed by insertion of pig tail drain under US guidance and antibiotic therapy. Early and late complications are shown in details in Table 2.

Table 1 Patients' demographic data

	Concomitant LSG and LC (N=70)	LSG (N=384)	P value
Mean age	42.44±10.32	39.03±15.57	0.079
Sex (female/male)	61/9	270/114	0.004*
Mean preoperative BMI (kg/m^2)	46.2±9.95	43.11±9.5	0.144
Obesity-related comorbidities [n (%)]			
Diabetes	6 (8.6)	23 (6)	0.417
Hypertension	8 (11.4)	25 (6.5)	0.145
Chronic joint pain	15 (21.4)	98 (25.5)	0.466
Hyperlipidemia	33 (25.7)	47 (12.2)	0.001*
Obstructive sleep apnea	2 (2.8)	6 (1.5)	0.449

LSG, laparoscopic sleeve gastrectomy. *P value >0.05 is significant.

Table 2 Early and late complications in both groups

Early complications (within the first 30 days)	LSG+CC (*N*=70) [*n* (%)]	LSG (*N*=384) [*n* (%)]
Deep vein thrombosis	0	3 (0.78)
Staple line leakage	0	1 (0.26)
Postoperative bleeding	1 (1.4)	9 (2.3)
Pulmonary atelectasis	1 (1.4)	5 (1.3)
Wound infection	6 (8.5)	18 (4.7)
Intraabdominal collection	1 (1.4)	
Late complications		
Gastroesophageal reflux	1 (1.4)	6 (1.5)
Gastric sleeve stricture	0	4 (1)
Port site hernia	2 (2.8)	5 (1.3)
Symptomatic gallstones		19 (5)
Over all complications	12 (17.1)	70 (18.2)

CC, concomitant cholecystectomy; LSG, laparoscopic sleeve gastrectomy.

Weight loss results

There was no significant statistical difference regarding the mean percentage of excess weight loss at 1, 3, 6, 12, and 24 months between both groups (Table 3). Moreover, there was no significant statistical difference regarding rate of comorbidities improvement between both groups during follow-up periods.

Table 3 Percentage of excess weight loss in both groups

Weight loss	Concomitant LSG and LC (*N*=70)	LSG (*N*=384)	*P* value
1 month	22.27±4.52	21.25±4.61	0.088
3 months	35.71±5.63	36.06±4.92	0.593
6 months	48.81±5.87	50.11±5.68	0.080
12 months	62.48±5.12	63.13±5.47	0.356
24 months	68.90±6.12	70.07±5.59	0.0113

LC, late complication; LSG, laparoscopic sleeve gastrectomy.

Discussion

It is well established that obesity is associated with a high prevalence rate of gallstone formations ranging between 19 and 45% [1,7,8]. Additionally, up to 50% of morbid obese patients undergoing weight loss surgery develop gallstone disease within the first 2 years after surgery. For these reasons, some bariatric surgeons recommend routine CC during bariatric surgery [7,9,10]. Others not agree with this concept owing to prolonged operative time, prolonged hospitalization, and increased risk of both surgical and anesthetic complications. A more selective widely accepted approach is to perform CC exclusively for symptomatic morbidly obese patients with proven GB pathology on preoperative imaging [2,5,11–13]. Our study protocol was to perform CC for all patients with image-documented GB disease regardless presence or absence of symptoms. This study revealed no statistical difference regarding overall morbidity rate between our both groups suggesting safety of CC during LSG. Similar results were published in the literature [1,14]. On the contrary, there are other published studies reporting that CC during gastric bypass surgery was associated with increased morbidity [2,15]. Regarding operative time and hospital stay in our study, the addition of CC to LSG prolonged the operative time by a mean of 25.81±7.59 min (range, 15–45 min) with no significant difference concerning the hospitalization period between patients undergoing CC plus LSG and those undergoing just LSG . Raziel *et al.* [1] reported similar results with prolonged operative time by 35 min owing to CC and had no significant effect on hospitalization. On the contrary, Coşkun *et al.* [8] reported prolonged operative time by 49.1 ±27.9 min (range, 15–110 min) for performing CC, whereas no significant difference concerning the hospitalization. Another study reported a mean operative time of 47.72±7.87 min (range, 34–62 min) for CC [16]. The relatively shorter operative time concerning CC in our studies may be attributed to our preference of harmonic shear use in dissection of Calot triangle and cauterization of the cystic artery. Unlike other studies, we performed CC through the same four ports of LSG without the need for additional trocar insertion either for LSG or CC, and this is attributed to our experience in three-port LSG. Regarding postoperative pain, we reported no statistically significant difference between both the study and the control group on VAS, and there were no differences in the type or amount of analgesia applied for both groups. In our study, the reported incidence of symptomatic GB stones after LSC (control group) was 5%. Our study results are similar to several studies in the literature. For example, Li *et al.* [17], Sioka *et al.* [18], and Aridi *et al.* [19] reported incidence of symptomatic GB stones after LSC of 3.8, 5.8, and 7.5%, respectively.

Conclusions

CC during LSG is feasible through the same ports, safe, and not associated with neither increased morbidity nor prolonged hospital stay period. It is better offered for morbidly obese patients with proven GB disease weather they are symptomatic or not to avoid future complications.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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