

Incidence of cholelithiasis after laparoscopic sleeve gastrectomy

Ilea Rabeea Alabbasi¹, Issam Merdan², Falih Mohsen Al-Gazgooz³

¹ M.B.Ch.B.; M.R.C.S., Board candidate in general surgery, Al-Sader Teaching Hospital, Basrah, Iraq

² M.B.Ch.B ; F.I.B.M.S.; C.A.B.S., Professor of Surgery, Department of Surgery, Collage of Medicine, University of Basrah, Iraq

³ M.B.Ch.B. ; F.I.B.M.S.;C.A.B.S.; F.A.C.S.; M.R.C.S., Consultant of general and laparoendospic surgery, Al-Sader Teaching Hospital, Basrah, Iraq

ABSTRACT

Background: Laparoscopic sleeve gastrectomy is a well-known method for weight reduction. Post-operative weight loss is a major risk factor for gallstone formation.

Objective: To determine whether prophylactic concomitant laparoscopic cholecystectomy should be performed on all patients at the time of laparoscopic sleeve gastrectomy or not.

Patients and Methods: A retrospective and prospective study on 540 patients with morbid obesity who underwent laparoscopic sleeve gastrectomy; their BMI range was between 38 and 53, their age range was 18 to 63 years, and 335 of them were females. The exclusion criteria were patients with a history of cholecystectomy, gallstone patients or gallbladder polyps more than 1 cm in preoperative abdominal ultrasound, and those who failed to follow-up. All patients were followed up with every 6–12 months, including those who had cholecystectomy by other surgeons.

Results: During the study period, from the total 540 patients who had laparoscopic sleeve gastrectomy, 167 patients (30.92%) had cholecystectomy, out of which 20 patients (3.7%) had achieved 45% weight reduction during the first six months; while in another 6 months, 147 patients (27.22%) had cholecystectomy, achieving additional 30% weight reduction.

Conclusions: The incidence of gallstones after laparoscopic sleeve gastrectomy is about 30.92%, indicating that 69.08% will not have gallstones in the postoperative follow-up period, so it would be unwise to do prophylactic concomitant cholecystectomy for all patients.

Keywords: Bariatric procedures, cholecystectomy, incidence

Corresponding author: Ilea Rabeea Alabbasi, M.B.Ch.B, Board candidate in general surgery, Al-Sader Teaching Hospital, Basrah, Iraq. E mail: iearabee@yahoo.com

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INTRODUCTION

Bariatric surgery has become one of the most common treatments offered for weight reduction, which improves obesity-linked conditions ⁽¹⁾ and life quality as well as survival.⁽²⁾

Laparoscopic sleeve gastrectomy (LSG) is a form of bariatric surgery that follows a restrictive procedure.⁽³⁾ It gained popularity due to its relative operative simplicity and lower risk profile as compared to other bariatric surgeries, with its short- and mid-term weight loss and associated outcome.⁽²⁾

LSG is done by removing a part of the stomach along the greater curvature and maintaining the biliary system, food passage, and the stomach innervation at the same time (Fig. 1) ⁽⁴⁾

Weight loss is achieved by reducing the gastric volume, which in turn leads to a decrease in the amount of food intake. Ghrelin is a hormone produced by the fundus of the stomach during fasting, which leads to an increase in the expression of the hypothalamic neuropeptide Y (NPY).⁽⁵⁾ Through LSG and excision of the gastric fundus, patients experienced markedly decreased levels of ghrelin and NPY, leading to suppressed appetites and longer periods of satiety and eventually reduced food intake.⁽⁶⁾ Gallstones developed in patients who experienced rapid weight loss—more than 25% of their original weight—within 6 months,^(4,7) with an incidence range between 28–71%, while gallstone prevalence in the general population is about 10–20%.⁽⁸⁾

The mechanism of gallstone formation is multifactorial, including an imbalance between chemical constituents of bile.^(1,3) Weight loss facilitates cholesterol mobilization from tissue and excreta in bile leads to an increase in bile

cholesterol concentration and eventually gallstone formation. On the other hand, there is an increase in gallbladder mucin and calcium secretion with prostaglandin and arachidonic acid, which poses a risk of stone formation.⁽³⁾ Decrease in gallbladder contraction and emptying due to the decrease in cholecystokinin as a result of disturbance in the neural pathway and decreased fat intake after sleeve gastrectomy leads to bile stasis, which is considered the aetiology in gallbladder pathologies.^(8–12)

There are three strategies for dealing with gallstones in bariatric surgery ⁽¹⁾ : selective concomitant cholecystectomy when a preoperative ultrasound shows pathologies like stones or polyps,⁽²⁾ prophylactic cholecystectomy to all patients,⁽³⁾ and conventional cholecystectomy if gallstones or symptoms develop after surgery.⁽¹³⁾

Concomitant cholecystectomy is limited due to its lengthy operation time and the requirement of additional port placement. The procedure could also be technically demanding.⁽¹³⁾ Some prefer concomitant cholecystectomy for patients with positive preoperative or intraoperative ultrasound.⁽¹⁾ While a delay in cholecystectomy is more easily achievable by massive weight loss, the major disadvantage is adhesion, additional cost, morbidity, and possible complications related to gallstone pancreatitis, cholangitis, and cholecystitis.⁽⁸⁾ If the choice is to perform concomitant cholecystectomy, recent studies advise performing cholecystectomy before LSG. If the cholecystectomy is straight forward with no suspicion of biliary injury, then the definitive LSG can be proceeded towards; otherwise, intraoperative cholangiogram is to be done if

that is available. In case intraoperative cholangiogram is not available or there's injury to the biliary tree, proceeding to LSG is not recommended because the need for ERCP may affect the stable line in the early post-operative period.⁽¹³⁾

Prophylactic cholecystectomy in obese patients and after bariatric surgery remains controversial.^(3,13,14)

Laparoscopic cholecystectomy in morbidly obese patients leads to increased difficulties and morbidity compared to non-obese patients.^(3, 15, 16, 17)

The aim of this study is to find out whether prophylactic concomitant cholecystectomy should be done or not, depending on the incidence of gallstones after LSG.

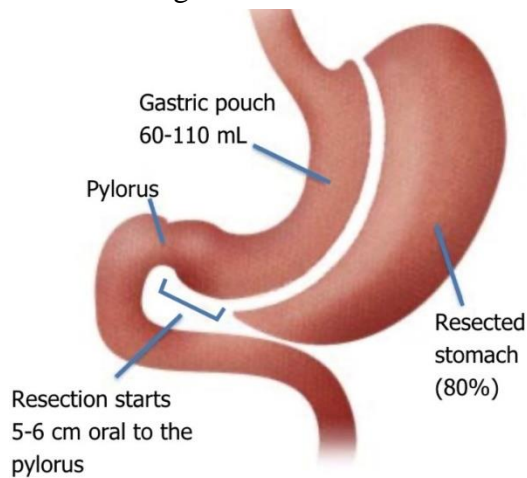


Figure 1: Surgical technique of LSG, showing the size of the final gastric pouch [from David B, Antonio M, Albert G, et al. Laparoscopic sleeve gastrectomy: More than a restrictive bariatric surgery procedure ?. *World Journal of Gastroenterology*.2015;21(41):11804-11814.]. open access paper with a CCBY-NC license.

PATIENTS AND METHODS

A retrospective and prospective study was conducted in the Department of Surgery, Alsader Teaching Hospital, Basrah, Iraq, from October 2015 to February 2019 on patients who

underwent LSG. The data collection began before the operation and continued until the latest patient's office visit one year postoperatively.

The exclusion criteria were patients with a history of cholecystectomy, gallstones, or gallbladder polyps more than 1 cm on preoperative abdominal ultrasound, and those who did not follow-up.

All patients had their history recorded, underwent physical examinations, and were sent for laboratory tests before surgery such as hormonal assay (serum cortisol, thyroid function tests), liver function tests, renal function test, blood glucose, lipid profile, serum vitamins, serum ferritin, bleeding profile, abdominal ultrasound, and psychiatric assessment. They received preoperative antibiotics and prophylactic anticoagulants (subcutaneous enoxaparin 4000 IU once per day).

Patients underwent LSG under general anaesthesia with a reverse Trendelenburg position. After five trocher placements and inflation with CO₂, the dissection of the greater omentum from the greater curvature of the stomach up to the esophageogastric junction was started. After this critical stage, the first linear stapler was placed at the point of the initial dissection on the greater curvature, creating a vertical cut on the gastric wall over a 36-Fr bougie and sequential firing of the endoGastro-Intestinal-Anastomosis (GIA) linear staplers were applied over it, up to the oesophageogastric junction. The gastric remnant was then easily extracted (Fig. 2).

Forty-eight hours after the surgery, all patients were discharged and sent home without any complications, and none of them were kept on prophylactic postoperative ursodeoxycholic

acid. All patients were subsequently followed-up with in outpatient clinic, and on each visit (6 and 12 months postoperatively), the body weight, blood glucose, lipid profile, serum ferritin, and serum vitamins were measured.

All gallstone-related symptoms were monitored, such as pain in the right upper quadrant, nausea, vomiting, fever, indigestion, belching, intolerance for fatty or greasy foods, jaundice, or abdominal pain unexplained by other aetiologies. Abdominal ultrasound was performed once they developed gallstone-related symptoms or routinely at 6 and 12 months after surgery.



Figure 2: Site of ports. [from DR. S. Oradian, A. Daneshpajouh, A, et al. Laparoscopic Sleeve Gastrectomy without over- sewing the staple line; A case series demonstration efficacy and minimization of both intra- and post-operative complications. International Journal of Surgery Open. Volume 8.2017;7-10.]. open Access Article with a CCBY-NC license.

RESULTS

The study included 540 patients with LSG, who were postoperatively followed up with for one year after intervals of 6 months.

All patients had a BMI range between 38 and 53, their age range was 18 to 63 years, and 335

of the patients (62%) were female and 205 (38%) were male, as shown in (Table 1).

The diagnosis of gallstones in post-LSG interval depends on the follow-up abdominal ultrasound or the development of gallstone-related symptoms.

In the first 6 months post-operation, 1 patient presented with biliary colic, 3 with acute cholecystitis (none had obstructed jaundice), 4 with abdominal pain unexplained by other aetiologies, and 12 patients presented with asymptomatic gallstones diagnosed by routine abdominal ultrasound done after the first 6 months (first visit). All these 20 patients were subjected to conventional laparoscopic cholecystectomy and were discharged without postoperative complications.

In the next 6 months, 1 patient presented with biliary colic, 107 with acute cholecystitis (non-complicated), 2 with obstructed jaundice, 7 with abdominal pain unexplained by other aetiologies, and 12 with asymptomatic gallstones discovered via routine abdominal ultrasound, which was done 12 months postoperative (second visit) for 30 patients. A total of 147 patients had conventional cholecystectomy in the second 6 months post-operation, as shown in (Table 2).

All the 20 patients (3.7%) who had cholecystectomy in the first 6 months follow-up in the postoperative period achieved 45% estimated body weight loss (EBWL), while all the 147 patients (27.22%) who had cholecystectomy in the second 6 months achieved an additional 30% EBWL (Table 3).

From the above results, we discovered that the total number of patients in our study's sample for whom cholecystectomy was done was 167 with an incidence of 30.92%.

Table 1: Demographic data of the patients

Demographic	Characteristics
Age	18–63 years (mean 40.5)
Sex	62% (335) female/38% (205) male
BMI	38–53 (mean 45.5)

Table 2: Gallstones presentations

Presenting features	No. (%) in first 6 months	No. (%) in second 6 months	Total No. (%) from total
Biliary colic	1 (0.59%)	1 (0.59%)	20 (37%)
Acute cholecystitis	3 (1.76%)	107 (64%)	110 (20.37%)
Obstructed jaundice	0	2 (1.19%)	2 (0.37%)
Unexplained abdominal pain	4 (2.39%)	7 (4.19%)	11 (2.03%)
Incidental finding on abdominal ultrasound	12 (7.18%)	30 (17.96%)	42 (7.77%)
Total number of cholecystectomy	20 (11.9%)	147 (88%)	167 (30.92%)

Table 3: postoperative weight loss and cholecystectomy

Interval after Lap. Sleeve gastrectomy	Percent of EBWL reduction	Number/percent of patients had cholecystectomy
First 6 months	45%	20 (3.7%)
Second 6 months	30%	147 (27.22%)
Total	75%	167 (30.92%)

DISCUSSION

Bariatric surgery is the most effective way for long-term, sustainable weight loss and decrease in obesity-related comorbidities.^(8,9)

Obese patients are at a higher risk of gallbladder diseases than the general population mainly due to an increased rate of cholesterol secretion without an increase in bile salts. Bile saturated with cholesterol during weight reduction, an increase in the amount of pronucleating proteins and mucin in the gallbladder, bile stasis due to decreased gallbladder contraction and emptying, and decreased cholecystokinin level after LSG

were thought of as aetiologies in gallbladder pathologies.^(8-12,14)

In our study, the mean age of the sample was 40.5 years, BMI 45.5, and proportion of female participants was 62%, which is similar to a study done in Jordan by Osama et al., wherein the mean age was 34, BMI was 42, and 66% participants were female.⁽¹⁴⁾

None of the patients in the study had postoperative prophylaxis against gallstone formations, as ursodeoxycholic acid, which reduces cholesterol saturation in bile and subsequently gallstone formation, was used. However, a study conducted in Saudi Arabia found that it is effective if patients use ursodeoxycholic acid three times per day with 6 to 12 months interval, which needs patient compliance and also costs them more; however, this would not eliminate gallstone formation. It decreases the incidence from 28% to 22%, and the percentage of symptomatic and complicated gallstones increases.⁽¹⁸⁾

Postoperative weight reduction in patients who developed gallstones was 45% and 30% (75% total) at the 6 and 12 months follow-up respectively; in comparison, VinkyKa et al. found that 24% loss of original weight indicated a significant risk for gallstones formation.⁽³⁾ Weight-loss speed was maximum in the first 6 months of the postoperative year in our study, which can be explained by the fact that the gradual extension of the stomach after the first 6 months with dysregulation of the hormonal axis was responsible for satiety/hunger. This was a result of the increased ghrelin hormone after the first month with stomach extension.⁽¹⁹⁾

The total amount of weight reduction in the first year was 75%, which was similar to a study

conducted in Poland by Andrzej Lehmann et al.⁽¹⁹⁾

In that study, 20.6% of the patients presented with symptomatic gallstones or biliary colic and complicated gallstones with obstructed jaundice after LSG, compared to the 0.37% of patients in VinkyKa et al.'s study, in which symptomatic gallstone was present in only 3.8% and complicated gallstone in 1.9% of patients.⁽³⁾

In our study, 30.92% of patients needed laparoscopic cholecystectomy during the first follow-up year, which was similar to a study by Wuttiorn Manatsathit et al. in Detroit, USA, wherein 30% of the patients had developed gallstones at the follow-up interval after 12 months.⁽⁴⁾ In our study, all the patients developed symptoms or 30% of them showed weight reduction during abdominal ultrasonography. This finding is similar to the previously mentioned study.⁽⁴⁾

All patients who developed gallstones post-LSG had a cholecystectomy (either symptomatic or not), which accounted for 30.9% of the total study group. This can be explained by the fact that a significant portion of the study group was symptomatic within a short period and developed a higher percentage of complications as compared to general population, and the difficulties associated with treating them, has been shown in study concluded in Greece.^(7,20,21)

CONCLUSIONS

All bariatric patients should undergo a preoperative abdominal ultrasound to detect the presence of gallstones before surgery so that patients with gallstones are treated with concomitant cholecystectomy.

Patients with no gallstones on preoperative abdominal ultrasound should not have prophylactic concomitant cholecystectomy as the post-LSG incidence of gallstones is only

30.92%. Therefore, it would be unwise to perform prophylactic cholecystectomy on about the other 69.08% of patients who may not develop gallstones in the future.

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