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**Review Article**

# Early and late complication of sleeve gastrectomy

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## ABSTRACT

The rate of obesity is on rise worldwide and almost 13% of the global population is obese leading to development of various other diseases and complications. Lack of effective outcome from conventional approach for weight control and loss is causing a transition among people to approach for bariatric surgeries. Sleeve gastrectomy is one of the surgical techniques of bariatric surgery aimed to achieve weight loss. Like any other surgical procedure, it also has certain post-operative complications associated with it. The complications of sleeve gastrectomy are further divided into early and late phase. The purpose of this research is to review the available information about early and late complication of sleeve gastrectomy. In the surgical treatment of morbid obesity, sleeve gastrectomy is the most widely performed bariatric procedure. It is a minimally invasive and risk-free surgery with a low risk of complications and death. The complication rates for early and late complication range from 5.4% to 7.3%, with incidence of serious complications ranging from 1.2% to 2.2%. Early complications include bleeding such as intraluminal or extraluminal, a leak in the staple line, and the formation of an abscess. While gastric stenosis, nutritional shortages, mediastinal pouch migration, and the development or worsening of gastroesophageal reflux disease are all late consequences. Older age, male sex, increased body mass index, smoking, and comorbidities are considered the risk factors for the development of complications of sleeve gastrectomy. Overall, sleeve gastrectomy is considered a safe and effective surgical weight loss technique.

**Keywords:** Early, Late, Complication, Sleeve, Gastrectomy

## INTRODUCTION

Obesity is one of the world's most significant health problems in the twenty-first century. In 2016, the World Health Organization (WHO) reported that over 650 million persons worldwide were obese, accounting for 13% of the global population. Organs and systems gradually deteriorate as a result of increased body mass. The most important risk factor for metabolic syndrome, which encompasses hypertension, dyslipidaemia, and insulin

resistance, is abdominal obesity. In comparison to the general population, patients with metabolic syndrome are more likely to develop myocardial infarction, stroke, and type 2 diabetes, which raises cardiovascular risk and contributes to higher mortality. Increased physical activity, dietary adjustments, and pharmaceutical therapy are all examples of conservative treatments for obesity. These treatments, however, are frequently insufficient to achieve optimal weight loss, and patients are advised to consider bariatric surgery. Laparoscopic sleeve gastrectomy (LSG), Roux-en-Y gastric bypass, and the use of an adjustable gastric band are among the most popular bariatric surgeries today.[1]

The sleeve gastrectomy is a laparoscopic bariatric treatment that involves removing the fundus and body of the stomach to form a long tubular gastric conduit that runs along the stomach's lesser curve. LSG was first recommended as a first-stage operation to lower the mortality and postoperative morbidity of more sophisticated bariatric procedures in higher-risk patients, such as the duodenal switch to full biliopancreatic diversion or the Roux-en-Y gastric bypass in a second stage. Soon after, it was discovered that many patients lost enough weight that a second-stage surgery was no longer required.[2-4] LSG, also referred as longitudinal or vertical gastrectomy, is a relatively novel and effective surgical treatment for morbid obesity management. It was first launched in 1990 as a less complication-prone alternative to distal gastrectomy with the duodenal switch surgery. Ren and colleagues performed the first LSG in 1999.[5-7]

When compared to laparoscopic Roux-en-Y gastric bypass and adjustable gastric band, LSG is developing as a viable surgical procedure for the treatment of morbid obesity, with appropriate morbidity and long-term weight loss. The lack of an intestinal bypass, which eliminates gastrointestinal anastomoses, metabolic derangements, and internal hernias, as well as reduced operating periods and no foreign body implantation, are all advantages of this treatment. LSG has a low risk of complications, making it a particularly appealing operation for high-risk patients. Male gender, advanced age, increased body mass index, and the presence of numerous comorbidities have all been linked to an increased risk of morbidity and mortality following bariatric surgery.[8]

Regardless of the fact that metabolic-bariatric surgery is presently the most successful treatment for morbid obesity, perioperative complications are still a possibility. The incidence of postoperative complications for LSG is 2.12%, which is lower than the incidence of postoperative complications for laparoscopic Roux-en-Y gastric bypass (3.02%). The mortality rate for LSG ranges from 0.18% to 0.27%, depending on the patient's age, sex, comorbidities, and the surgical centre’s expertise. Early or acute complications develop within 30 days of the surgery, while late or chronic complications develop more than 30 days after the surgery.[9,10] Leakage, bleeding in the staple line, gastric pouch stenosis, mediastinal pouch migration, wound infection, and nutrient deficits are the most prevalent complications after LSG. Acute pancreatitis, partial spleen infarction, and pulmonary embolism are fewer common complications.[11] The purpose of this research is to review the available information about early and late complication of sleeve gastrectomy.

## METHODOLOGY

This study is based on a comprehensive literature search conducted on 06 June 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about early and late complication of sleeve gastrectomy. There were no restrictions on date, language, participant age, or type of publication.

## DISCUSSION

Obesity is a public health concern that has reached epidemic proportions as obesity incidence has continued to climb worldwide, resulting in an increase in the number of bariatric procedures performed. The most effective technique of morbid obesity therapy is bariatric or metabolic surgery, which produces excellent results not only in terms of weight loss but also in the improvement or resolution of obesity-related disorders. LSG is the most extensively used bariatric operation in the surgical treatment of morbid obesity. It is a minimally invasive and safe procedure with low complications and death rates. However, like with any surgical procedure, it bears the risk of complications and associated death. After LSG, the 30-day mortality rate is approximately 0.2%. Early and post-LSG complication rates range from 5.4% to 7.3%, with serious complications ranging from 1.2% to 2.2%. Older age, male sex, increased body mass index, smoking, and comorbidities such as dyslipidaemia, hypertension, diabetes, obstructive sleep apnea, liver disease, depression, and others are all considered risk factors for overall complications after LSG. The identification of risk factors for problems following LSG would allow for effective preoperative patient management and postoperative care.[12]

### *Early and late complications*

After LSG, the risk of postoperative bleeding has been estimated to be between 1% and 6%. Intraluminal or extraluminal bleeding can occur. An upper gastrointestinal bleed is the most common symptom of intraluminal bleeding from a staple line. Hematemesis or melena stools are common symptoms. Intraluminal bleeding is diagnosed and treated using the same algorithm as an upper gastrointestinal haemorrhage. One of the most serious and feared side effects of LSG is gastric leak. It affects up to 5% of people who have undergone LSG. Another possible

complication after LSG is the formation of a stricture. It can show up right after surgery as a result of tissue edema, or it can present later.[13] Sleeve leaks, which occur in high-pressure systems, are estimated to be more common, with rates ranging from 1% to 7% and are more resistant to treatment. The majority of sleeve gastrectomy leaks happen towards the top of the sleeve, where blood supply is unstable. The high pressure is caused by the pyloric and lower esophageal sphincters, as well as stenosis, a twist in the sleeve gastrectomy, or a kink in the sleeve gastrectomy. If the leak is to be successfully treated, these anatomic narrowing must be addressed. Patients who are stable but have leakage following a sleeve gastrectomy can have image-guided drainage treatments.[14]

Findings of a 5-year prospective study in 2017 depicted that LSG showed to be safe and beneficial in terms of weight loss as a stand-alone surgery, especially among patients with a preoperative body mass index of less than 40 kg/m.[15] Another retrospective cohort study results in 2017 showed that overall, 5.8% of patients experienced complications. Staple line leak (1.2%), bleeding (1.2%), deep venous thrombosis (0.4%), and 30-day mortality (0.21%) were among the early complications. Stricture formation (0.21 %) and new onset Gastro-esophageal reflux disease were among late complications (2.8%).[16] Mittermair in 2014 reported that clinical indicators of surgical leakage or bleeding after LSG include tachycardia, discomfort, fever, and hypotension. The key to ensuring appropriate therapy with prompt re-laparoscopy is early detection of these complications. However in their findings re-laparoscopy was required in eight patients (5.2%) due to postoperative bleeding (3.3%) and leaking (1.9%).[17]

In 2016 based on a cohort of 47,092 patients, a French study extracted data from a national perspective database and found a 0.13% death incidence after sleeve gastrectomy between 2007 and 2012. The history of the death rate over the research period revealed a threefold decrease, from 0.25 % to 0.08% in 2012. The following risk factors were shown to be linked with post-operative mortality in multivariate analysis: male gender, age >50 years, body mass index >50 kg/m$^2$, hypertension, type 2 diabetes, laparotomy versus laparoscopy, and the hospital volume of bariatric surgeries.[18] Despite the fact that bariatric procedures are generally regarded safe, they do carry the risk of perioperative complications. Identification of potential complication risk factors would allow for better preoperative patient optimization, as well as reasonable postoperative care and early detection and treatment of potential complications. An increase in the number of stapler firings utilized during LSG and a longer time of LSG should alert a surgeon to an increased risk of postoperative complications.[19]

Short-term results from a single-centre study in 2018 showed that at 90 days after surgery, all patients had their follow-up data obtained. There was a total complication rate of 4.4%. There were no leaks in any of the patients. A case of bleeding needed a surgical investigation, which revealed that the source of the bleeding was a diaphragmatic vessel. The mortality rate after 90 days was 0%. The sleeve gastrectomy procedure has a minimal complication risk. Selection of the optimum staple height and strengthening of the staple line may be important factors in improving sleeve gastrectomy outcomes.[20] Findings of a comparative study in 2018 revealed that LSG was performed on 93,062 patients (69%) while laparoscopic Roux-en-Y gastric bypass was performed on 41,080 patients (31%). 178 deaths occurred in 96(0.1%) patients of LSG group, while 82 (0.2%) deaths were reported in laparoscopic Roux-en-Y gastric bypass group ($p<0.001$). Morbidity was observed in 8% of the patients (5.8% in LSG versus 11.7% in laparoscopic Roux-en-Y gastric bypass, $p<0.001$). Leaks were found in 1% of the study population (0.8% in LSG versus 1.6% in laparoscopic Roux-en-Y gastric bypass $p<0.001$). Body mass index, albumin, and age were the most important predictors of all outcomes. laparoscopic Roux-en-Y gastric bypass exhibited greater risks of all complications as compared to LSG in the adjusted multivariate models (leak: odds ratio 2.10, $p<0.001$; morbidity: odds ratio 2.02, $p<0.001$; death: odds ratio 1.64, $p<0.01$).[21]

Ischemia of the spleen is one of the perioperative and early complication of LSG. The division of the final fundus attachments might result in the occlusion of an artery supplying blood to the spleen's upper pole, resulting in partial splenic ischaemia. Adherences from prior surgery such as gastric banding or anatomical variants like a splenic artery to the top pole of the spleen coming from the posterior gastric artery make this problem more likely. The splenic parenchyma's colour changes quickly, allowing for a rapid diagnosis. The severity of splenic ischaemia determines the clinical symptoms and biological consequences. Hyperthermia and biological indicators of inflammation are sometimes misinterpreted as other problems, such as a leak. Computed tomography scans confirm the diagnosis and assist in determining the amount of splenic ischaemia. Antibiotics may be required depending on the severity of clinical indications, although in the vast majority of instances, the evolution is spontaneously favourable.[22]

Staple-line haemorrhage and anastomotic leak are the two most prevalent surgical complications following LSG. When wound healing occurs between the inflammatory and fibrosis phases, classic ischemia leaks have been documented to develop 5 to 7 days after surgery. A cutaneous fistula, peritonitis, abscess, sepsis, organ failure, and death can all arise from an extraluminal gastric leak. In various investigations on LSG, the incidence of gastric leak ranges from 0.7 to 5% with an average of 2.3 %. Postoperative gastric leak can appear as anything from an asymptomatic radiography finding to peritonitis, septic shock, multisystem organ failure, and death.[23] Aridi stated in his long-term outcome study findings that after 5 years, LSG resulted in adequate percent excess weight loss and co-morbidity clearance in the patient population. Patients

with a body mass index of 45 kg/m$^2$ had excellent results. One out of every five individuals experienced de novo acid reflux symptoms. The most prevalent long-term complication was cholelithiasis, which required cholecystectomy.[24]

Sroka stated that bleeding from the staple line is the most common cause of gastrointestinal haemorrhage which is included among the early complications of LSG. Patients have upper gastrointestinal bleeding symptoms include haematemesis and melena. Tachycardia, hypotension, and reduced haemoglobin are all symptoms of peritoneal cavity haemorrhage. The staple line, spleen and liver injury, or trocar site bleeding are the most common causes of peritoneal haemorrhage.[25] Turcu reported that after LSG, the risk of gastric stenosis is about 1%, but this rises to as high as 10% in situations of revision surgery and is one of the late complications of LSG. Food intolerance, dysphagia, nausea, and vomiting are common complaints among patients. Signs of the organic stenosis include the presence of a leak and abscess, an extremely tight gastric sleeve, mediastinal migration of the cardia, and intramural hematoma after oversewing the staple line. While causes of functional gastric stenosis include obstruction at the incisura angularis, axial twisting of the stomach tube, and small intestine volvulus.[26] Sleeve gastrectomy is a successful weight-loss procedure that has a low risk of causing malnutrition in the patient. Regular check-ups are essential for post-operative care, both to ensure a healthy outcome and to identify complications early. In a long-term follow-up, sleeve gastrectomy might cause reflux and weight gain, so patients should be carefully chosen for this surgery.[27] Literature supports the evidence that LSG is the safer technique for weight loss owing to lower number of complications and morbidities are associated and reported, however there is a need of more clinical long-term studies and randomized clinical trials to report more clinically effective results.

## CONCLUSION

Since the obesity rate and burden is increasing globally the need for LSG procedure is on significant rise also. As with any surgical procedure, LSG is accompanied with the risk of postoperative complications. Surgeons should closely follow patients after surgery to detect postoperative complications immediately and implement appropriate diagnosis and treatment approaches.

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