CASE REPORT PEER REVIEWED | OPEN ACCESS

Can laparoscopic gastric sleeve procedures predispose to the development of a hiatal hernia?

Arinxe Randy Gauthier, Michael Vaccarella, Logan Campbell, Devi Patel, Jaquito Jorge

ABSTRACT

Laparoscopic sleeve gastrectomy (LSG) has emerged as an effective intervention for obesity, offering substantial weight loss and improved metabolic health. However, alongside its benefits, this procedure may also precipitate certain complications, including gastro-esophageal reflux disease (GERD). Gastro-esophageal reflux disease, characterized by the reflux of stomach contents into the esophagus, can lead to significant discomfort and complications if left untreated. One such complication is the development of a hiatal hernia, where a portion of the stomach protrudes into the chest cavity through the esophageal hiatus. This case report explores the case of a 35-year-old female patient developing a post-LSG complication of GERD, and its subsequent development of hiatal hernias. It examines the mechanisms underlying GERD post-gastric sleeve, and how it elucidates the role of chronic acid exposure in weakening the esophageal sphincter and promoting hiatal hernia formation. While LSG offers significant benefits for patients with obesity, it is imperative to recognize and address potential complications such as GERD and hiatal hernias. Understanding these interrelated complications is crucial for clinicians managing patients' post-LSG.

Keywords: Gastro-esophageal reflux disease, Hiatal hernia, Laparoscopic gastric sleeve

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INTRODUCTION

Laparoscopic sleeve gastrectomy is one of the leading bariatric procedures for morbid obesity today as a successful first-stage procedure. During this procedure, the greater curvature of the stomach is removed. This results in the stomach being shaped like a "sleeve." Next, the remaining stomach is then sealed off with staples. Overall, approximately 80% of the stomach is removed. With a reduced stomach capacity, the patients will have decreased food intake and reduced hunger due to decreased ghrelin hormone from fundus removal. Numerous studies have indicated that first-stage LSG leads to a significant reduction in comorbidities and the need for medications [1].

Gastro-esophageal reflux disease occurs when there is a temporary loss of lower esophageal sphincter tone, leading to backflow of stomach acid. This backflow of stomach acid can therefore lead to irritation in the esophagus. Gastro-esophageal reflux disease can commonly present as regurgitation, heartburn, or dysphagia. It may proceed following an LSG due to the narrowed size of the stomach. If GERD is not managed properly, chronic reflux can lead to Barrett's esophagus and potentially esophageal adenocarcinoma.

A fundectomy is a surgical procedure that is performed to remove the fundus of the stomach. This procedure could secondarily reduce GERD symptoms in patients for a number of reasons. Removing the fundus would decrease the patient's stomach volume, and would

therefore decrease the pressure and reduce backflow into the esophagus. Additionally, removing the fundus would also be removing parietal cells needed to secrete hydrochloric acid. This would reduce the amount of stomach acid in the stomach leading to decreased acid reflux.

Hiatal hernias occur when the stomach protrudes through the diaphragm. There are two types of hiatal hernia—sliding and paraesophageal. Sliding hiatal hernias occur when the gastroesophageal junction slides up into the hiatus and is more commonly associated with GERD. Paraesophageal hernias occur when the fundus protrudes into the thorax. This type of hernia comprises 5% of all hiatal hernias [2].

CASE REPORT

A 35-year-old African American woman presented to the clinic with chronic and progressive gas esophageal reflux, and abdominal discomfort occurring after meals. The patient denied any recent illness or sick contacts, fever, shortness of breath, or changes in bowel or urinary habits. Despite trying over-the-counter heartburn medications, the patient found no lasting relief. After discussion, the patient agreed to undergo an esophagogastroduodenoscopy (EGD) for further evaluation.

The patient's medical history presents several notable events, including a long-standing diagnosis of asthma from childhood, a sleeve gastrectomy in 2022, and a cholecystectomy in 2023. However, these factors do not appear to directly correlate with the development of a hiatal hernia. While hiatal hernias are often associated with age, obesity, and genetic predispositions, the relationship between these surgeries and hiatal hernia development may warrant further investigation. It is essential to comprehensively assess all aspects of the patient's medical history to inform the current evaluation effectively.

The impression of the EGD study confirmed a normal oropharynx. Gastroesophageal flap valve classified as Hill Grade IV (no fold, wide open lumen, hiatal hernia present). Also noted was LA Grade A reflux esophagitis. A biopsy was taken to rule out Barrett's esophagus. Evidence of previous gastric surgery was noted (sleeve gastrectomy 2022), characterized by erythema. The duodenal bulb, the first portion of the duodenum, and the second portion of the duodenum all appeared to be within normal characteristics.

Following a comprehensive assessment, including a thorough history and physical examination as well as a review of the EGD findings, the patient was consulted regarding the diagnoses made by the consulting surgeon. Subsequently, the patient was informed of her available treatment options. Upon discussion, the patient provided consent for surgical repair of the hiatal hernia.

Throughout both the clinic visit and hospital stay, the patient remained alert and fully oriented to person, time, and place, showing no signs of distress or discomfort. Vital signs for the patient are detailed in Table 1.

The patient's laboratory tests revealed no obvious abnormalities except for the red blood cell (RBC) and mean corpuscular volume (MCV). The complete blood count (CBC) is listed in Table 2.

After obtaining consent, the patient was escorted to the operating room (OR) for a comprehensive procedure aimed at correcting a hiatal hernia and performing a fundectomy. Notably, the surgical team encountered anticipated scarring due to the patient's prior abdominal surgeries as stated above. Delicately, the surgeon meticulously dissected away adhesions formed between the stomach and the left lower liver, as well as between the fundus and spleen, to pave the way for the current intervention.

Table 1: Patient demographics and results: First day of clinic and the day of the surgery

Vitals	03/01/2024 (first clinic visit)	05/01/2024 (day of surgery)
BP	127/82 mmHg	155/84 mmHg
Weight	78.9 kg (174 lb)	78 kg (172 lb)
BMI (calculated)	31.9	31.5

Abbreviations: BP, blood pressure; BMI, body mass index; mmHg, millimeters of mercury; kg, kilogram; lb, pound.

Table 2: Laboratory parameters

Test name	Result	Reference range
CBC		
RBC	5.51 m/mm^3	3.63–5.04 m/mm^3
MCV	78.6 fL	80.0–100.0 fL

Abbreviations: CBC, complete blood count; RBC, red blood cell; MCV, mean corpuscular volume, k/mm^3, thousand per cubic millimeter; m/mm^3, million per cubic millimeter; g/dL, grams per deciliter; mg/dL, milligrams per deciliter; mmol/L, millimoles per liter; mL/min, milliliters per minute; IU/L, international units per liter.

Following the meticulous dissection of scar tissue, the focus of the surgical procedure shifted toward addressing the hiatal hernia. The surgeon proceeded to incise the phrenoesophageal ligament and skillfully identify and safeguard the vagus nerve throughout the entirety of the operation. Employing precise techniques, they performed cruroplasty, effectively rectifying the 2 cm hiatal hernia. Furthermore, with meticulous attention to detail, they dissected and removed the excess fundus, ensuring not to compromise the diameter of the proximal stomach.

Operative images depicting the state before and after the repairs of the hiatal hernia and fundectomy

are detailed in Figures 1–3. Additionally, the specimen of the dissected extra fundus was carefully collected and forwarded to pathology for further analysis which tested negative for intestinal metaplasia, dysplasia, or malignancy.

Following the surgery, the patient was extubated, roused, and transferred to the post-anesthesia care unit (PACU) for close monitoring by the nursing team. Subsequently, the patient was discharged home the same day.

Three months post-op, the patient's GERD symptoms have improved but occasionally experience minor symptoms. The patient continues to have difficulty swallowing solid food, feeling as though it gets stuck. This symptom was present prior to surgery and persists. In addition, the patient's weight has remained stable with no changes from the day of surgery. The patient is being monitored and has regular scheduled follow-up appointments with her surgical team.

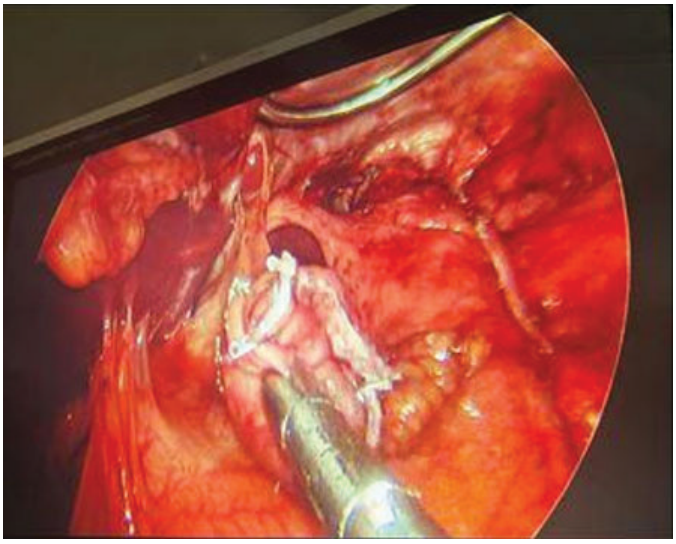

Figure 1: Hiatal defect.

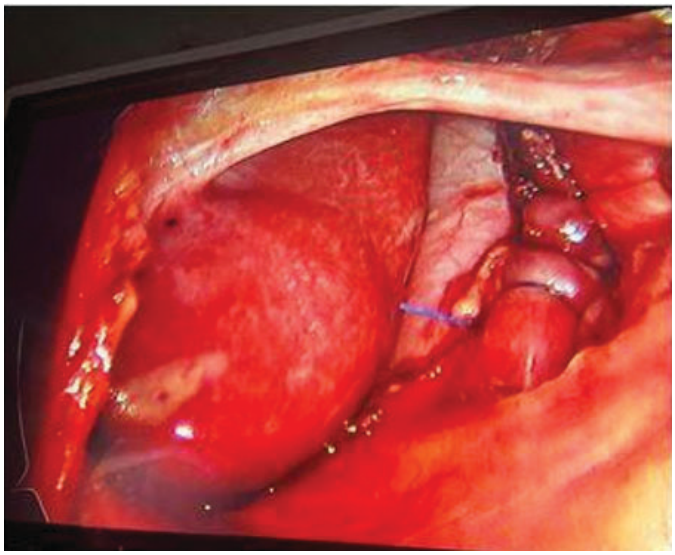

Figure 2: Cruroplasty.

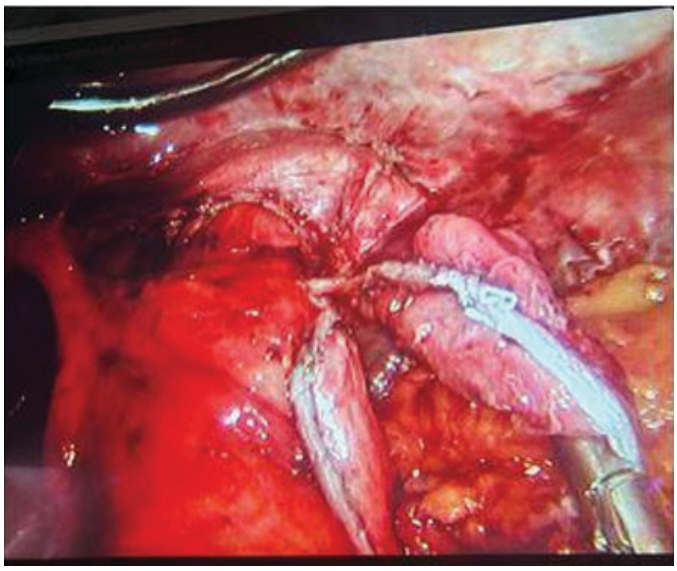

Figure 3: Fundectomy repair.

DISCUSSION

Obesity is considered a global epidemic by the World Health Organization (WHO), especially in the United States [3]. Some of the weight loss management options for this complex, chronic disease are lifestyle modification, pharmacotherapy, and even bariatric surgical procedures, which have become increasingly popular. Bariatric procedures can cause patients to lose about "50–70% of excess weight, 20–30% loss of the patient's initial weight, or a body mass index (BMI) < 35 kg/m²" [4]. Laparoscopic sleeve gastrectomy (LSG) surgery is one of the most common bariatric surgical procedures done in patients who are morbidly obese (BMI 40+) [5]. Despite the benefit of weight loss from having LSG done, complications also come with it, which are broken down into 2 categories: *acute* (within 30 days of surgery) and *late* (after 30 days of surgery). Some acute complications of LSG include "leakage, hemorrhage (intraluminal or extraluminal) staple line bleeding, and abscess formation," while some of the late complications include "gastric pouch stenosis, mediastinal pouch migration, wound infection, nutrient deficiencies," and even the "development or worsening of gastroesophageal reflux disease" or GERD [6, 7].

The late complication of GERD is of some significance because our case presented with a patient who had LSG surgery back in 2022. Before the surgery, the known condition that she was experiencing was asthma and she was morbidly obese, which led to her undergoing the LSG surgery in the first place. Obesity is an important risk factor for the development of GERD [8]. However, about 1–2 years post-LSG procedure, the patient returned to the ED with a chief complaint of heartburn and spitting up of mucus with red streaks of blood. A research cohort study was done for 213 patients who had undergone LSG surgery and the results were that new-onset heartburn was developed in 47% of patients [9]. In other studies,

33–35% of patients of LSG surgery patients developed GERD [10, 11]. As we can see in the results of these studies, it is more than probable that the development of GERD seems to have occurred in the patient as a result of the LSG surgery. Gastro-esophageal reflux disease in this patient was confirmed by esophagogastroduodenoscopy (EGD) and fluoroscopy of the upper gastrointestinal (GI) tract with air contrast and kidneys, ureters, and bladder (KUB) X-ray.

So, we understand that LSG surgery can lead to GERD, but can it lead to hiatal hernia? That would be considered uncommon, according to the American College of Surgeons, which stated that hiatal hernia formations are uncommon post-operatively after LSG surgery with only a few reported cases. In fact, some studies have stated that the percentage of development of hiatal hernias is low [11, 12]. But is this development of hiatal hernia in post-LSG patients so improbable? What could have led up to the hiatal hernia seen in the patient, which was present, but missed and not noted pre-operatively on diagnostic imaging before LSG surgery in 2022? Obesity is an independent risk factor for hiatal hernias and are seen in over 50% of pre-operative morbidly obese patients. Factors such as the increased intra-gastric pressure due to intra-abdominal or visceral fat seen in obese patients contribute to the development of hiatal hernia [13]. As we know, the patient before surgery was morbidly obese. In addition to this, the connection between the hiatal hernia and this post-op LSG surgery patient would also be the symptomatic GERD (heartburn) that the patient was experiencing. In addition to obesity, other risk factors for a hiatal hernia include chronic coughing, Asthma, and GERD which the patient possesses [14, 15].

In most studies, you find that hiatal hernias are risk factors for the development of GERD [15]. As stated before, the hiatal hernia was missed pre-operatively before the LSG procedure. However, there is evidence for it being a two-way street in that GERD is also a risk factor for the development of hiatal hernia formations. The 2 conditions are closely associated. The mechanism of the development of hiatal hernia in GERD patients is that acid regurgitation weakens the lower esophageal sphincter (LES) over time, causing a weakening of the diaphragmatic hiatus muscles surrounding it, causing the upper portion of the stomach (known as the gastric cardia) to bulge out through the diaphragm into the esophagus [16, 17]. Because of this information, we hypothesize that the patient, who was morbidly obese prior to LSG surgery, developed GERD post-operatively over time. While experiencing symptomatic GERD worsening, one of the associated symptoms that she began to experience was chronic coughing, even leading the patient to cough up mucus with blood streaks in it, prompting her to come to the ED for further evaluation. The weakening of the LES muscles due to her coughing and acid regurgitation has led to the formation of a hiatal hernia.

There may be some evidence for the development of hiatal hernias in post-LSG patients. Rapid weight loss post-LSG surgeries may lead to increased risk of hernia development due to the enlargement of the hiatal orifice, and because of the effect of muscle depletion of the diaphragm pillar muscles. There is an increased risk of herniation by the dissection angle of His and the left pillar during gastric tube creation [13]. However, in light of this information, the direct connection between LSG surgery to hiatal hernia formation seems to be more uncommon than common. However, through the constellation of conditions such as morbid obesity and GERD and their complications, it is plausible, even probable, that the patient developed the hiatal hernia as a result, warranting surgical repair.

Many patients who have undergone LSG surgery require revision surgery for “inadequate weight loss, weight regain, and/or the development of severe upper gastrointestinal symptoms,” which can include symptoms of GERD [18]. One of the revision surgeries that can be done is a laparoscopic fundectomy (LF), which is known to improve GERD symptoms. Fundectomies are normally done when a residual fundus/neofundus is associated with severe GERD symptoms. In a study that was done with 19 patients who was experiencing severe GERD, all patients experienced improvements in GERD symptoms to the point where they stopped taking their proton pump inhibitor (PPI) treatment for GERD [18]. As stated before, this patient was experiencing GERD symptoms, and to alleviate her symptoms, a fundectomy was done.

CONCLUSION

In conclusion, this case report highlights the possibility of post-LGS complications such as hiatal hernia due to multifactorial causation and the importance of post-LGS management to prevent potential complication cascades. Early recognition and management of GERD symptoms are essential to prevent complications such as esophagitis, Barrett’s esophagus, and, ultimately, hiatal hernia formation. Strategies for GERD management post-gastric sleeve include lifestyle modifications, pharmacotherapy, and in some cases, revisional surgery. By comprehensively understanding the pathophysiology and risk factors involved, clinicians can optimize post-operative care and improve patient outcomes.

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Author Contributions

Arinxe Randy Gauthier – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Michael Vaccarella – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.

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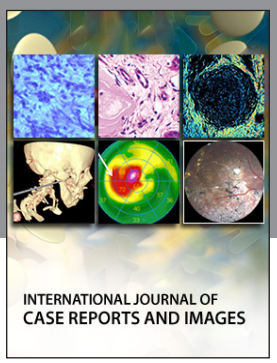

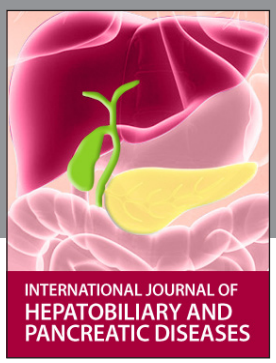

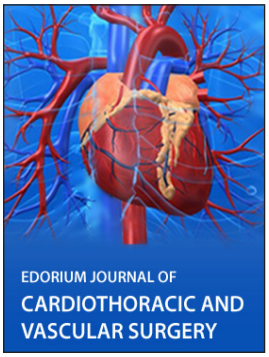

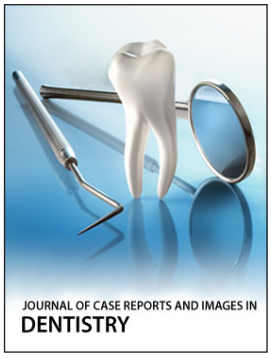

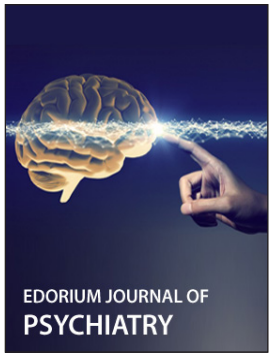

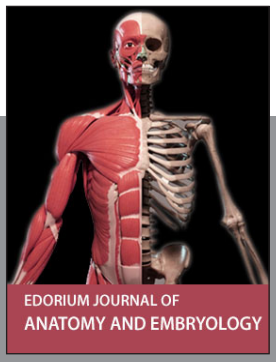

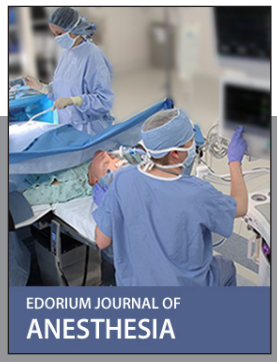

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