

# Surgical management of staple line leak after laparoscopic sleeve gastrectomy

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## Abstract:

**Background:** Laparoscopic sleeve gastrectomy (LSG) is derived from the biliopancreatic diversion with duodenal switch operation (BPD-DS). Specific and potentially severe complications of LSG are bleeding from the staple line and staple line leakage (SLL). A staple line leak may result in severe morbidity with potential sepsis and multi-organ failure.

**Objectives:** To review our experience with the definitive surgical management of staple line leak Post sleeve gastrectomy and its outcomes.

**Patients and methods:** retrospective review of patients who underwent definitive surgical treatment of staple line leak post sleeve gastrectomy from May 2014 till June 2016 at Saint Raphael center of morbid obesity, Primary surgery was laparoscopic sleeve gastrectomy in all patients. Staple line leak was diagnosed at the gastroesophageal junction in all patients.

**Results:** Six female patients were treated with definitive surgical management, mean body mass index was  $42.7 \pm 4.0$  (range from 35.3-51.2 kg/m<sup>2</sup>), all patient had no associated co-morbidities related to obesity, the mean age of the patients was 36 (range from 29-43 years), The leak was at the Gastroesophageal junction in all patients. All patients were fully recovered after definitive surgical treatment of leak, no signs of persist leak during the follow up period, with no mortality

**Conclusions:** Definitive surgical repair with conversion to Roux-en-Y gastric bypass, is safe and very effective and should be done when the general condition of the patient is optimized whenever possible.

**Keywords:** laparoscopic sleeve gastrectomy, leak management, Roux-en-Y gastric bypass.

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## Introduction:

Laparoscopic sleeve gastrectomy is derived from the biliopancreatic diversion with duodenal switch operation (BPD-DS) (1,2). Sleeve gastrectomy functioned as the restrictive component of the procedure. Later, LSG was advocated as the first step of a two-staged procedure for high-risk patients, with the intention of reducing co-morbidities and operative risk, and to be followed by either BPD-DS or laparoscopic Roux-en-Y gastric bypass (LRYGB) (2). However, often, satisfactory weight loss was achieved after LSG, and second-stage procedures were found to be unnecessary (1,2,3). Because of the success of LSG in the first stage, it is gaining momentum as an isolated bariatric procedure (2,3).

Specific and potentially severe complications of LSG, although rare, are bleeding from the staple line and staple line leakage (SLL). SLLs are more frequently (80%) "high leaks" or proximal leaks (occurring at the level of the cardia, below the gastro-esophageal junction), with an incidence of approximately 1.3% (range, 0% to 10%), whereas "lower leaks" or distal leaks occur in 0.5% of cases. (4) This difference in the incidence is partly explained by the better vascular

supply of the stomach body compared with the cardia.

A staple line leak may result in severe morbidity with potential sepsis and multi-organ failure (3,4).

Although in laparoscopic RYGBP there is a similar stapled resection when creating the gastric pouch with a long staple line, staple line leak seems to be less likely to occur. One of the surmises that has been formulated as a potential underlying mechanism of the staple line leak in the LSG is increased intraluminal pressure secondary to tubular gastric volume reduction, which may further impair the vascular supply (5).

Staple line leaks have been defined as acute, early, late, and chronic. In "acute leaks" (occurring within the first 48 h), a reduced mechanical strength is more likely due to technical errors and staple line crossing, whereas a vascular supply deficiency and gastric inflammation account primarily for "early leaks" (within the first week) (6).

Staple line leak management depends on the presence and size of intra-abdominal collections, on the extent of the leak, and on the patient's hemodynamic status. Nonsurgical approaches (endoscopic covered stent placement, biological glue injection, defect clipping, and/or image-guided drainage in various combinations) may be safe and effective when appropriate (6). Alimentary exclusion, antibiotics, and parenteral nutrition may be the ancillary therapies. The general consensus has it that

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the use of a stent for acute proximal leaks is a valid treatment option, whereas chronic leak stenting is of limited utility. Surgery aims to cleanse and drain intra-abdominal collections and may be immediately required in case of uncontained symptomatic leaks [even with normal upper gastrointestinal series (UGS)]. Surgeons should wait for at least 12 weeks of conservative therapy before reintervention to convert or revise proximal leaks (if the patient is stable)(7,8).

In case of chronic leaks, a possible treatment option, to be considered when the other modalities fail, is to place a Roux-en-Y bowel loop over the leak (realizing a one-loop minigastric bypass) or to proceed to a conversion to an RYGBP. Suturing of the leaking site is not recommended according to the most recent guidelines,(7,8) as it appears ineffective.

The aim of this study to review our experience with the definitive surgical management of staple line leak Post sleeve gastrectomy and its outcomes.

#### **Patients and methods:**

This retrospective review of patients who underwent definitive surgical treatment of staple line leak post sleeve gastrectomy from May 2014 till June 2016 at Saint Raphael center of morbid obesity, the definitive surgeries for leak management done by same surgeon.

Primary surgery was laparoscopic sleeve gastrectomy in all patients, most of sleeve gastrectomy were performed at other hospitals or by other surgeons. Patient were generally young and all were female. The initial presentation of the leak ranged from septic shock and peritonitis to small contained left subphrenic abscess. Only one patient had failed intervention before definitive surgical treatment (endoscopic stenting), and this intervention was done before the patient presented to our center. All patients underwent clinical examination before the surgical treatment, leak evaluation done by CT scan of the abdomen and pelvis with oral and IV contrast, all patient received broad spectrum antibiotics, DVT prophylaxis, and adequate fluid resuscitation, staple line leak was defined as early- intermediate if  $\leq 7$  days and late if  $>7$  days. Sepsis was defined as fever  $>38^{\circ}\text{C}$ , elevated inflammation markers (WBC count more than 11,000), and tachycardia (HR more than 90 bpm).

Surgical technique: after CT scan diagnosis of staple line leak, patients were transported back to the operating room for definitive surgical repair, the original port sites were used to re-access the abdomen, the abdomen was inspected and irrigated, staple line leak was diagnosed at the gastroesophageal junction in all patients, leak was confirmed with pneumatic testing during laparoscopic washout, conversion to Roux-en-Y gastric bypass done by creating a 15-30 cc gastric pouch distal to the leak site by Covidien™ purple tristaple, the ligament of Treitz was identified, the jejunum was transected with a linear stapler at 40 cm, and the mesentery was left intact. The

efferent limb was followed for 75 cm, and jejunojunostomy was performed using the linear stapler. The Roux limb was brought in as antecolic, antegastric fashion. After creating the gastrojejunostomy with the linear stapler, the staple lines were oversewn on the pouch, then feeding gastrostomy tube was created in the native stomach, a wide-bore drain tube was fixed near the site of leak and brought out through left upper quadrante port incision.

Post operatively, patients were monitored closely for clinical deterioration, all patients were kept on broad spectrum antibiotics (Meropenem-metronidazole), and systemic anti fungal (fluconazole), patient were maintained nil per oral in the immediate postoperative period, gastrostomy tube feeding starting at second post operative day in all patients, oral diet started 2 weeks in all patients after the surgical management, and the gastrostomy tube feeding was removed 5 days after starting oral intake, follow up of all patients done at 2 weeks, 3 weeks, 4 weeks and 12 weeks post operatively by clinical exam, abdominal ultrasound and CT scan of the abdomen and pelvis with oral and IV contrast, tube drain was removed 3 weeks post operatively in all patients.

#### **Results:**

Six female patients were treated with definitive surgical management, 4 (66.6%) of them were referred from other hospitals or the primary surgery was done by other surgeons, mean body mass index was  $42.7 \pm 4.0$  (range from 35.3-51.2 kg/m<sup>2</sup>), all patient had no associated co-morbidities related to obesity, the mean age of the patients was 36 (range from 29-43 years), The leak was at the Gastroesophageal junction in all patients, The mean time from the initial operation to the diagnosis of leak was 24 days (range from 6-42 days), 4 (66.6%) patients had late leak while two patients had early-intermediate leak (Table 1). Mean hospital stay was 6 days range from (5-7 days), only one patient (16.6%) had complication post surgical treatment and presented with recurrent left subphrenic collection due to inadequate drainage and treated with re-laparoscopy with wash and drainage and placement of wide-bore arm tube near the site of leak, all patients were fully recovered and no signs of persistent leak during the follow up period, with no mortality.

Table 1 Timing of leak, presentation and prior interventions

	Age of patient	Time of leak detection (days)/early or late leak	Leak location	Clinical presentation	Prior intervention
Patient 1	32	12/late	Gastroesophageal junction	Left subphrenic abscess	Non
Patient 2	29	20/late	Gastroesophageal junction	Left subphrenic abscess	Endoscopic stenting
Patient 3	39	21/late	Gastroesophageal junction	Septic shock	Non
Patient 4	32	6/early	Gastroesophageal junction	Peritonitis	Non
Patient 5	43	42/late	Gastroesophageal junction	Septic shock-peritonitis	Non
Patient 6	30	7/early	Gastroesophageal junction	Left subphrenic abscess	Non

**Discussion:**

Laparoscopic sleeve gastrectomy is a core procedure in the bariatric surgeon's armamentarium and is increasingly being used as a first line treatment for clinically severe obesity(9). Advantages of LSG include excellent weight loss outcomes, co-morbidity resolutions, relative ease of the technique, avoidance of foreign bodies or adjustments, shortened operating time, and immediate restriction of caloric intake(10). Despite the low morbidity rate, some complications after LSG have been challenging to manage. Staple line leakage is one of these complications, which can become chronic, recurrent, and require multiple interventions(11). Till now there is no guidelines for treatment options for staple line leak following sleeve gastrectomy. Most published articles describe endoscopic stenting with variable results(8,12). The endoscopic stenting techniques described require expertise in stent placement and retrieval, which is not always available. Complications are not uncommon including stent slippage, migration, perforation, and life threatening bleeding (8,12). Most of these complications require some kind of re-intervention, which can add morbidity and cost. Even when properly positioned, stents are not guaranteed to seal the fistula, with healing rates reported between 50 to 80% in the literature(12,13). Leak are known to most frequently occur at the gastroesophageal(GE) junction in LSG patients(10,14,15). Our finding coincided with these reports, as all leaks occurred at the GE junction. Such leaks are more likely to occur in sleeve gastrectomy patients with distal stenosis, resulting in difficulties in gastric emptying, also high intraluminal pressure and low compliance of the gastric tube may be the main cause of leak(5,13,16), this is why Roux-en-Y gastric bypass, seems to be pathophysiologically a relevant solution, it bypasses both difficulties ( lack of gastric compliance and high intraluminal pressure). However, additional factors are most probably

implicated in the occurrence of leaks, including impaired suture line healing, poor blood flow, infection, and poor oxygenation with subsequent ischemia(13,16). The surgical treatment of staple line leak as demonstrated in our series, can be quite successful and very effective, the conversion to Roux-en-Y gastric bypass seems to have many advantages including gastric preservation, less metabolic and mineral deficiencies also the Roux-en-Y gastric bypass preserving the primary aim of the laparoscopic sleeve gastrectomy( weight loss maintenance and resolution of obesity related co-morbidities). What differentiates our surgical technique from previously published series(15,16,17) is that we transect the alimentary tract just below the the level of leak, preserving a cuff of gastric wall, along with lesser curvature side for a safer anastomosis, in addition we kept the distal native stomach and intubated it, for both decompression and feeding. We believe this is safer than total gastrectomy as it eliminated the risk of duodenal stump leak. The most important factor in reducing the incidence of post-SG leaks is prevention. Relevant steps include gentle tissue handling, optimal use of endostaplers, prevention of distal stenosis, adequate hemostasis without damaging tissues with electrocautery, reinforcement of staple line by continuous seromuscular suture from the angle of His to the mid stomach, and the use of a bougie of 36F or more should be considered a major factor in decreasing the risk of leak(18,19).

**Conclusions:**

With sleeve gastrectomy becoming increasingly practiced as a primary bariatric procedure, surgeons need reliable methods to manage and treat complications from this surgery. Management of leaks after LSG can be challenging. Early diagnosis and treatment is important in the successful management of leaks. It is important that we develop safe, effective and

economically efficient algorithms to treat this difficult problem. Definitive surgical repair with conversion to Roux-en-Y gastric bypass, is safe and very effective and should be done when the general condition of the patient is optimized whenever possible. However, a larger study is needed to draw definite conclusions.

#### Authors Contributions:

Dr. Ramiz Sami Mukhtar: operated all patients (main surgeon), patients follow up, literature review

Dr. Mohammed Qasim Abdul Jabbar: data collection, study design, manuscripts writing

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