

# EARLY EXPERIENCE IN LEAK AFTER LAPAROSCOPIC SLEEVE GASTRECTOMY

By

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## ABSTRACT

**Background:** Laparoscopic sleeve gastrectomy (LSG) has been introduced as a surgical option in bariatric surgery. Leaks after bariatric operations are usually life-threatening complications. However, its incidence after LSG is not well evaluated.

**Objectives:** Report leaks with sleeve gastrectomy over a 41-month to analyze the clinical course and management of those patients.

**Patients and Methods:** Between January, 2013 and May, 2016, (41 months) 280 morbidly obese patients have undergone laparoscopic sleeve gastrectomy at New Damietta University Hospital. Among the above patients, 8 patients (2.85%) were complicated with a staple line leak. All leaks occurred at the upper angle of staple line. Management of staple line leak was done with conservative measures for one patient, laparoscopic exploration for five patients (one of them was re-explored with laparotomy after ten days for re-leak), and endoscopic application of stent for two patients.

**Results:** The study included five women and three men. The patients were between 20 and 50 years of age (mean age 34 years). The BMI of these patients ranged from 38 to 48 kg/m<sup>2</sup> (mean BMI 43.6 kg/m<sup>2</sup>). Two patients (25%) had early and six patients (75%) had late leaks. Two patients were managed with laparoscopic exploration and suturing of the leak site. Stent was applied endoscopically for two patients. Three patients were managed with exploratory laparotomy. Percutaneous drainage with conservative measures was enough for one patient.

**Conclusion:** The keystone in successful management of staple line leak is early diagnosis and rapid intervention. Surgical technique is of significant importance to successful surgical outcome. Gentle handling of tissues, optimal staple-line formation, and ensuring adequate hemostasis without causing tissue damage from electro-cautery are important. Selection of the proper method of management depends on timing of diagnosis, facilities and surgeon experience.

**Keywords:** Sleeve gastrectomy, leak, stent.

## INTRODUCTION

Obesity is an increasingly serious public health problem on a global level and associated with increased mortality and a high burden of obesity related morbidities, such as diabetes mellitus, hypertension, osteoarthritis and obstructive sleep apnea syndrome (Padwal et al., 2011).

There are several procedures involved in the surgical management of morbidly obese patients. The most popular are laparoscopic Roux-en-Y gastric bypass, laparoscopic sleeve gastrectomy and laparoscopic adjustable gastric banding (Boza et al., 2012).

Laparoscopic sleeve gastrectomy was initially conceived as a potential first step prior to a more complex procedure (Roux-en-Y gastric bypass or biliopancreatic diversion-duodenal switch) to reduce the overall operative risk in super-obese or high-risk patients (**Pomerri et al., 2010**).

Now, laparoscopic sleeve gastrectomy carried out as a single and definitive bariatric procedure with promising short-term results. This operation is gaining popularity because of its simple methodology and low technical demands. Today it is a first-line solution in the worldwide obesity epidemic and is a reasonable alternative of laparoscopic gastric bypass (**Albanopoulos et al., 2016**).

Stenosis, leak along the staple line, and bleeding have been described. Of these, the most feared complication is a gastric leak. The incidence of leak was reported at an average of 2.7% from 24 studies with 1,749 patients, and many approaches have been employed for the management of this complication (**Nguyen et al., 2010**).

Postoperative leaks are significant complications resulting in considerable morbidity and increased rate of mortality (**Eltokhy et al., 2016**).

According to a recent meta-analysis, the incidence of this complication is 2.2%. Early onset and/ or poorly tolerated gastric leak may require further reoperation. Ancillary treatment involves endoscopy, with implantation of a coated stent, a double pigtail stent, or both. Additional options include percutaneous radiologic drainage or stricturotomy combined with endoscopic dilation (**Lionel et al., 2016**).

The present work aimed to report sleeve gastrectomy leaks over a 41-months period to analyze the clinical course and management of these patients.

## PATIENTS AND METHODS

Between January, 2013 and May, 2016, (41 months) 280 morbidly obese patients had underwent laparoscopic sleeve gastrectomy at New Damietta University Hospital. Among the above patients, 8 patients (2.85%) were complicated with a staple line leak, were included in this study.

The criteria for inclusion were the confirmation of a gastric leak using any of the following imaging methods: methylene blue test, CT scan, or an upper gastrointestinal radiograph with contrast medium. The following variables were studied: gender, age, body mass index (BMI), intraoperative staple line bleeding, employment of reinforcement sutures along the staple line, and antibiotic prophylaxis. Postoperative studies included location of the leak, treatment approaches, and mortality. Clinical symptoms and signs were recorded for all patients every 6 hours.

For the purpose of defining key terms, leaks are classified as acute (<7 days), early (1–6 weeks), late (>6 weeks), and chronic (>12 weeks) after the primary procedure. A leak may progress to a fistula after 12 weeks (**Nguyen et al., 2016**).

In accordance with UGI contrast studies, gastric leaks have been classified as follows (**Petersen et al., 2013**):

1. Type I or subclinical: This corresponds to local leakage, with no spillage or

dissemination, through a fistulous track to the pleural or abdominal cavity.

2. Type II or clinical: This corresponds to leakage with great dissemination or diffusion to the pleural or abdominal cavity, by way of an irregular pathway.

All patients received low molecular weight heparin at the night of operation and prophylactic 3<sup>rd</sup> generation cephalosporine antibiotic pre-operatively.

Reinforcement of the staple line with absorbable sutures at the time of sleeve gastrectomy was performed in five patients, while not performed in three patients. Two patients were complicated with staple line bleeding which managed with staplers. A leak test was carried out in all patients before finishing the procedure. In all patients, a tube drain was inserted adjacent to the remnant stomach for at least 3 days after surgery. Oral intake was started after 24 hours in all patients.

All leaks were occurred at the upper angle of staple line. Two patients were managed with laparoscopic exploration and suturing of the leak site. Stent was applied endoscopically for two patients. Three patients were managed with exploratory laparotomy. Percutaneous drainage with conservative measures was enough for one patient.

**Statistical analysis:** The collected data were organized, coded and tabulated using statistical package for social science (SPSS) version 18 (SPSS Inc., USA). The quantitative data were presented as arithmetic mean, standard deviation, minimum and maximum. On the other hand, qualitative data were presented as frequency (number) and percent distribu-

tion and for comparison Chi square test was used, P value <0.05 was considered significant.

## RESULTS

The study included eight patients: five women and three men. The patients were between 20 and 50 years of age (mean age 34 years). BMI of these patients ranged from 38 to 48 kg/m<sup>2</sup> (mean BMI 43.6 kg/m<sup>2</sup>). All of them underwent laparoscopic sleeve gastrectomy after complete laboratory, radiologic, and endoscopic investigations. Two patients (25%) had early and six patients (75%) had late leaks.

A sudden onset of abdominal pain was the main symptom in the two patients with an early leak. The two patients developed tachycardia and fever in conjunction with the pain episode. Due to the previously mentioned symptoms, a complication was suspected and an abdominal CT scan was immediately performed. The CT scan showed findings compatible with a leak characterized by the presence of subdiaphragmatic air and a collection adjacent to the remnant stomach.

On the other hand, in the six patients with a late leak, symptoms were more gradual and began between 8 and 20 days after the operation. Abdominal pain located in the upper portion of the abdomen associated with fever was the first symptom, then developed respiratory symptoms characterized by cough and inspiratory pain. After their admission, patients with a late leak also underwent an abdominal CT as initial diagnosis test. In all patients, the CT scan showed an abdominal collection beside the remnant stomach.

The two patients, whom were diagnosed with an early leak underwent immediate laparoscopic reoperation. One patient had a diffuse peritoneal compromise of the peritoneal cavity. After cleaning the abdominal cavity, the location of the leak was identified and closed employing laparoscopic manual sutures. Drains were placed close to the leak area. This patient was re-explored with laparotomy after one week and re-suturing of the same leak site. The other patient underwent laparoscopic exploration of the abdominal cavity and drainage of a collection adjacent to the stomach, without attempting to closure the hole, which was unnoticeable.

The six patients whom were diagnosed as late leak were managed as follows:

Two patients were managed with endoscopic stent plus percutaneous drainage of collection. Three patients were managed with exploratory laparotomy and suturing of the leak site, followed with minor collection, which managed with percutaneous drainage and patients got well. One patient was managed with percutaneous drainage only. The leak and sepsis were controlled, and improved the general condition of the patient. In all these patients, the origin of the leak was the upper portion of the stomach. All patients had oral food suspended and were given antibiotic treatment (Table 1).

**Table (1):** Patient's characteristics.

Variables		Statistics	Test	P value	
Gender (n,%)	Male	3 (37.5%)	0.50	0.48	
	Female	5(62.5%)			
Age (mean±SD); range		(34.0±9.2); 20-50			
BMI (mean±SD); range		(43.6±3.3); 38-48			
Timing of leak (n,%)	Early	2 (25%)	2.0	0.15	
	Late	6(75.0%)			
Reinforcement of staple line during sleeve gastrectomy		5 (62%)			
Staple line bleeding and reinforcement with staplers		2 (25%)			
Management of leak	Early	Laparoscopic re-exploration	2 (100.0%)	-	
	Late	Laparoscopic re-exploration	3 (50.0%)	1.0	0.60
		Stent	2 (33.3%)		
		Percutaneous drainage	1(16.7%)		

## DISCUSSION

Sleeve gastrectomy may be seen as an extension of the Magenstrasse and Mill procedure. The first open sleeve gastrectomy was performed in March 1998. A year later, the first laparoscopic duodenal switch with a sleeve gastrectomy was reported on a porcine model (**Hedberg et al., 2014**).

LSG is a relatively simple surgical procedure with lower complication rates and without major impact on the normal path of digestion and absorption. Performed initially by Gagner et al (2009; 2010) in super-obese patients as the first stage of biliopancreatic diversion and proving good results in terms of weight loss and resolution of comorbidities, LSG was soon used as an independent bariatric surgical procedure (**Gagner et al., 2013**).

Laparoscopic sleeve gastrectomy (LSG), also known as longitudinal or vertical gastrectomy, is a relatively new and effective surgical option for the management of morbid obesity. It was initially introduced in 1990 as an alternative to distal gastrectomy with the duodenal switch procedure to reduce the rate of complications (**Frezza, 2007**).

At the time, LSG was considered a first-stage operation in high-risk patients before biliopancreatic diversion or Roux-en-Y gastric bypass (**Yaghoobian et al., 2012**).

Laparoscopic sleeve gastrectomy was subsequently found to be effective as a single procedure for the treatment of morbid obesity. Although LSG functions as a restrictive procedure, it may also cause early satiety by removing the

ghrelin-producing portion of the stomach (**Gumbs et al., 2007**).

Sleeve gastrectomy usually associated with increasing satiety with subsequent reduction of food intake due to either an elevated intra-gastric pressure or possibly from a decrease in ghrelin levels, which are secreted mainly by the fundus. The delay in gastric emptying is believed to occur due to decrease in food intake after a restrictive surgery, such as LSG (**Serrot et al., 2011**).

A staple line leak is a serious complication. According to different studies, the occurrence rate ranges between 0.5% and 5% of patients (**Tan et al., 2010**).

Clinical presentations of leaks vary from asymptomatic patients who have their leaks detected during the radiological study of the gastrointestinal tract, to patients presenting symptoms of sepsis characterized by peritonitis, septic shock, and multi-organ failure (**Burgos et al., 2009**).

A higher degree of suspicion is essential in order to obtain an early diagnosis. Fever, tachycardia, and abdominal pain during the postoperative period are symptoms of a possible gastric leak. Tachycardia is the earliest sign of a possible leak. Intraoperative leak prevention interventions described for sleeve gastrectomy include oversewing, tissue sealants, and glue. There is still considerable debate over the utility or superiority of any of these interventions (**Julie et al., 2015**).

In the first International Consensus Summit for Sleeve Gastrectomy, reported treatment of leak included early

oversewing, drainage (CT guided or open), endoscopic clipping, and persisting fistulas requiring fibrin glue, stents, Roux loop, and even total gastrectomy (**Deitel et al., 2008**).

**Oshiro et al. (2010)** reported that; they have successfully managed delayed gastric leaks with drainage (either surgical or percutaneous), establishment of a feeding route (enteral or parenteral) and placement of gastric stents for approximately 2–4 weeks. Other investigators have also used intraluminal stents for the management of gastric leaks. **Kumbhari et al. (2015)** reported their experience in the management of patients with gastric leak after sleeve gastrectomy with stenting. These investigators left the stents in situ on average for 7 weeks. Immediate success was observed in 19 patients after placement of the first stent, whereas 5 patients required placement of a second stent. Two patients had persistent leaks requiring a surgical intervention.

Anastomotic leakage and formation of fistulas represent one of the most dangerous complications after bariatric surgery that can lead to life-threatening situations and death. If they are found during the early postoperative course, reoperation and surgical management with sutures, and eventual resection and reconstruction of an anastomosis, may be effective. However, in many cases, inflammatory changes are present in the surrounding tissues and leakage may recur. Operative treatment is the mainstay for patients with signs of sepsis and hemodynamic instability (**Serra et al., 2007**).

Reinforcement of staple line with sutures during sleeve gastrectomy has no

extra benefits for prevention of leak. Staple line bleeding which controlled with staples does not affect the staple line integrity. The placement of stent can temporarily bypass the site of leakage and allow the patients to maintain enteral nutrition until complete closure of the leak. Any intra-abdominal fluid collections or abscesses must be properly drained, besides placement of the stent. Different modalities of management can take the patient to the safe side of the river, if the problem had taken seriously and promptly.

## CONCLUSION

The keystone in successful management of staple line leak is early diagnosis and rapid intervention. Surgical technique is of significant importance to successful surgical outcome. Gentle handling of tissues, optimal staple-line formation, and ensuring adequate hemostasis without causing tissue damage from electrocautery are important. Selection of the proper method of management depends on; timing of diagnosis, facilities and surgeon experience.

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## الخبرات المبكرة في تسريب ما بعد جراحة تكميم المعدة بالمنظار

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**خلفية البحث:** يعتبر تكميم المعدة من العمليات الحديثة للتحكم في السمنة المفرطة. ومن أخطر مضاعفاتها ما يطلق عليه التسريب، ويمكن علاجه جراحيا.

**الهدف من البحث:** متابعة حالات التسريب بعد جراحة إستئصال كم المعدة بالمنظار في مدة ٤١ شهرا لتحليل المسار الإكلينيكي وعلاج أولئك المرضى.

**المرضي وطرق البحث:** تضمن البحث ٢٨٠ مريضا في الفترة من يناير ٢٠١٣ إلى مايو ٢٠١٦ (٤١ شهر)، وتم إجراء تكميم للمعدة، وذلك في مستشفى جامعة الأزهر بدمياط الجديدة.

**النتائج:** حدث تسريب في ٨ مرضي (٢,٨٥%) في الزاوية العليا لخط التدبيس، وتضمن البحث ٥ سيدات و٣ رجال، وقد كان متوسط أعمارهم ٣٤ عاما، وكان متوسط مؤشر الكتلة الجسدية ٤٣,٦%، وحدث التسريب مبكرا لدي إثنين من المرضي (٢٥,٠%)، وكان متأخرا لدي ٦ من المرضي (٧٥,٠%). وقد تم عمل علاج تحفظي لمريض واحد عن طريق تفريع التسريب من خلال الجلد، وتم عمل إستكشاف بمنظار البطن الجراحي لخمسة مرضي (منهم مريض تم عمل إستكشاف جراحي تقليدي لتكرار التسريب بعد عشرة أيام)، وتم عمل غرز جراحية لمكان التسريب. كما تم تركيب دعامة عن طريق منظار المعدة لإثنين من المرضي.

**الاستنتاج:** التحكم الناجح في التسريب يكمن في التشخيص المبكر والتدخل السريع. ومن أهم الأسباب لتحاشي التسريب إستخدام التقنية الجراحية المناسبة، وعدم إستعمال العنف مع الأنسجة، والتأكد من توافق خط التدبيس مع التحكم بالنزيف بدون تدمير الأنسجة بالكي.