

Treating sleeve gastrectomy leak with endoscopic stenting: the kuwaiti experience and review of recent literature

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Abstract

Background Obesity today is a leading cause of global morbidity and mortality, and bariatric surgeries such as laparoscopic sleeve gastrectomy (LSG) are increasingly playing a key role in its management. Such operations, however, carry many difficult and sometimes fatal complications, including leaks. This study aims at evaluating the effectiveness of endoscopic stenting in treating gastric leaks post-LSG.

Methods A retrospective study was conducted to the patients who were admitted with post-LSG gastric leak at Al-Amiri Hospital Kuwait from October 2008 to December 2012 and were subsequently treated with stenting. The patients were stented endoscopically with self-expandable metal stent (SEMS), and a self-expandable plastic stent (SEPS) was used to facilitate stent removal.

Results A total of 17 patients with post-LSG leaks underwent endoscopic stenting. The median age was 34 years (range 19–56), 53 % of the patients were male, and mean body mass index (BMI) was 43 kg/m². The median duration of SEMS placement per patient was 42 days (range 28–84). The SEPS-assisted retrieval process took a median duration of 11 days (range 14–35). Successful treatment of gastric leak was evident in 13 (76 %) patients, as evident by gastrografin swallow 1 week after stent removal. In addition, a shorter duration between the

LSG and the time of stent placement was associated with a higher success rate of leak seal.

Conclusions The use of SEMS appears to be a safe and effective method in the treatment of post-LSG leaks, with a success rate of 76 %. The time frame of intervention after surgery is critical, as earlier stent placement is associated with favorable outcomes. Finally, SEPS is often required to facilitate SEMS removal, and further modification of stents and its delivery system may improve results.

Keywords Bariatric · Endoscopy · Obesity · G-I < endoscopy · Therapeutic/palliation < endoscopy · General < endoscopy

Obesity is one of the leading causes of global morbidity and mortality, with more than 2.8 million adults dying each year due to its complications. These complications include heart disease, stroke, diabetes mellitus, musculoskeletal disorders, as well as endometrial, breast and colon cancer [1].

The necessity for bariatric intervention is apparent by the immense number of overweight and obese individuals around the world. For example, within the population of Kuwait, it is estimated that 75.4 %, specifically 74–86 % of women and 69–77 % of men suffer from this pandemic [2, 3].

The emergence of the laparoscopic sleeve gastrectomy (LSG) as a novel bariatric operation with promising results has, therefore, gained much attention. The surgery, though very effective carries with it a burden of complications, some of which have proven to be fatal. The most common complications of LSG can be divided into acute: hemorrhage, staple line leak, abscess formation, and chronic: stricture, nutritional deficiencies (vitamin B12, vitamin D, folate, iron, and zinc), and gastro-esophageal reflux disease [4]. In light of their significant effects on morbidity,

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mortality, and quality of life, post-operative leaks are an issue that needs to be urgently addressed.

The principal factors that lead to leaks after LSG are thought to be dependent on the regional anatomy. The gastro-esophageal junction has a decreased blood supply making it more difficult for the healing process to progress, and the angle of His is thought to be thinner making it difficult to create a sufficient seal. Combining these two factors coupled with the increased intragastric pressure, a formed leak would take a lengthy period of time to close [5]. Recent efforts in finding an effective option for the management of leaks have been challenging. One emerging method that is gaining recent popularity is endoscopic stenting. Theoretically, the deployment of a stent across the anatomical area of leakage would not only serve as a temporary sealant, but might also aid in the correction of the sleeve axis in cases of gastric twist as well as allow oral intake during the process of healing. This study aims at assessing the effectiveness of endoscopic gastric stenting in treating post-LSG staple line leaks.

Materials and methods

A retrospective study was conducted of the patients who were admitted to Al-Amiri Hospital Kuwait from October 2008 to December 2012 with post-LSG leaks and were subsequently treated with endoscopic stenting. Sleeve leak was diagnosed based on evidence of contrast leak on a gastrografin swallow and/or abdominal CT scan and upper endoscopy. Once the leak was identified, an intra-abdominal drain was inserted by laparoscopy or percutaneous CT guidance if the patient was hemodynamically stable.

The patients then underwent endoscopic gastric stent placement as a two-step procedure. The first step involved placement of a self-expandable metal stent (SEMS) made from a single-stranded nitinol wire with a flexible polyurethane covering (ultraFlex™ Boston scientific: proximal flare 23 mm, shaft diameter 18 mm, stent length 150 mm, covered length 12 cm, proximal length 12 cm). The second step was endoscopic placement of a self-expandable plastic stent (SEPS) made of a polyester mesh with silicon coating, along with radial forced and radiopaque ends (polyFlex™ Boston scientific: proximal flare 28 mm, shaft diameter 23 mm, stent length 150 mm, delivery system diameter 13 mm). The SEPS was inserted 2 weeks prior to SEMS removal to detach the fibrosed granulating tissue from the SEMS mesh, thereby facilitating retrieval. After 6–8 weeks, both stents were removed endoscopically after an on-table gastrografin swallow confirmed leak seal. A final gastrografin swallow was done 1 week post-stent removal to confirm closure of leak.

In the event that a leak was discovered during the gastrografin swallow, the stent was kept for an additional 4 weeks. After this the patient underwent a repeat gastrografin swallow, and if the leak was still refractory to healing the patient was offered a conversion to roux en-Y gastric bypass (RYGB).

All patients who were treated with stents were put on a gastric diet protocol, but those with unsatisfactory oral intake were given temporary naso-jejunal feeding. Patients with an element of esophageal spasms were prescribed anti-emetics for the first 48 h alongside proton-pump inhibitors. Patients were then kept on regular proton-pump inhibitors until after stent removal, and then prescribed as needed.

As mentioned above, abdominal drains were inserted prior to the stents, either by surgical or percutaneous methods. Once the drain produced less than 30 ml per day and there was no evidence of a persistent leak, it was removed.

Statistical analysis of the data was carried out using SPSS software.

Results

A total of 17 patients with post-LSG leaks underwent endoscopic stenting. The median age was 34 years (range 19–56), and 53 % of the patients were male. The mean body mass index (BMI) was 43 kg/m², and 1 (6 %) patient had history of previous bariatric procedure (gastric band). There were 16 (94 %) patients with anatomical high leaks and 1 (6 %) patient with a low leak at the antrum of stomach.

Of the 17 patients with sleeve leak, all were stable on initial presentation except two patients who came with septic shock. They were not considered fit for stenting initially, and were treated by emergency drain insertion in the operating theater followed by a course of intravenous antibiotics. Once the patients were deemed stable, they underwent stenting in the same manner of the other patients, and both had successful seal of the leak.

The median duration of SEMS placement per patient was 42 days (range 28–84). The SEPS-assisted retrieval process took a median duration of 11 days (range 14–35). Successful treatment of gastric leak was observed in 13 (76 %) patients, as evident by gastrografin swallow 1 week after stent removal. There were four (24 %) patients with a persistent leak, of whom two had a high leak, one with a low leak, and one patient with a chronic fistula to the pleural cavity. In terms of the time duration between the LSG operation and initial stent placement, early stenting was associated with a higher success rate [Table 1].

Table 1 Timing between LSG and endoscopic stenting

Time since LSG	n (%)	Success rate (%)
Less than 1 week	10 (58.8 %)	100
1 week–30 days	6 (35.3 %)	50
More than 30 days	1 (5.9 %)	0
Overall (17 patients)	17	76

In terms of complications, minor bleeding post SEMS/SEPS removal was evident in 2 (12 %) patients, which was managed conservatively, dysphagia during stent placement occurred in 3 (18 %) patients, and 1 (6 %) patient had stent migration.

Of the four patients with persistent leak, two were converted successfully to RYGB, while the other two traveled abroad for further treatment and were afterwards lost to follow-up.

Discussion

According to the Canadian Medical Association, the current recommended methods of practice for management of early diagnosis of gastric leak post-LSG are laparoscopy with repair of the leak and abdominal washout followed by jejunostomy feeding [4]. In the event of a delayed diagnosis, however, inflammation tends to distort the anatomy.

In such cases, percutaneous drainage and stenting along with intravenous antibiotics and a high dose proton-pump inhibitors can be a suitable alternative [5–7].

It is noteworthy to comment on the significant influence of the host response to an established leak post-LSG and its relation to formulating a management plan. A patient who has a leak yet clinically well and does not present with an active inflammatory response is a good candidate for stenting. Conversely, a deteriorating patient who is going into shock should not undergo stenting and must be managed with emergency surgery. The pattern of patients that present with shock is variable and cannot be predicted [8].

This study has shown the successful treatment of gastric sleeve leaks in 76 % of subjects by the SEMS and SEPS endoscopic stent technique, with earlier stenting resulting in better outcome. Despite the scarcity of publications on this topic and small sample sizes, this number is comparable to other studies in the literature [Table 2]. A meta-analysis of seven studies (67 patients total) on the use of self-expandable stents in treating bariatric surgery leaks revealed an 87.7 % success rate, though the bariatric operations were not looked at individually [9]. Simon et al. had a total of seven LSG leak patients with a 78 % success rate after undergoing endoscopic *Hanarostent* (M.I. tech, Seoul, Korea) and *Taewong* stents combined with drainage [6]. Another study by Pequignot et al. with a total of six subjects who underwent LSG and stenting with *Hanarostent* attained success rates of 84 % [10]. Finally, a study looking into endoscopic treatment of leaks in 21 post-

Table 2 Review of past publications of endoscopic treatment of sleeve leak

Author et al.	Year	n	Success rate (%)	Stent type	Mean duration (days)	
Serra	2007	3	66	Hanarostent	120	
Devriere	2007	4	75	Partially SEMS	N/A	
Oshiro T	2009	2	100	Hanarostent	90	
Casella	2009	3	100	Ultraflex + NITI-S	55	
Nguyen N	2010	3	100	Alimaxx-E	63	
Blackmon S.	2010	4	100	Alimaxx-E, Ultraflex	27.7	
Tan	2010	4	50	N/A	N/A	
Jurowich C.	2011	3	100	NITI-S	N/A	
Inbar R.	2011	3	100	SX-ELLA	42	
<i>Hanarostent SEMS</i> M.I. Tech, Seoul, Korea, <i>Ultraflex</i> coated metallic, Boston Scientific, <i>NITI-S esophageal covered stent</i> Taewoong Medical, <i>Wallflex</i> Boston Scientific, <i>SX-ELLA SEMS</i> Czech republic, <i>Plastic Biliary Endoprosthesis</i> Soehendra, Tannenbaum biliary stent, Cook, Limerick, <i>Plastic Pancreatic stent</i> Greenen pancreatic stent, Cook, Limerick, <i>Alimaxx-E</i> Alveolus, Charlotte, NC, USA	Aretxabala X.	2011	4	100	Covered stents	39
Abraham A	2012	1	100	Fully Covered Wallflex	42	
Fischer A.	2012	2	100	Ultraflex	24	
Pequignot A.	2012	19	94.70	Hanarostent	28	
Sakran N.	2012	11	55	Endoscopic stent	40	
Simon F	2013	9	78	Hanarostent	45	
Slim R	2013	3	100	Plastic biliary + pancreatic endoprosthesis	60.9	
Corona M	2013	6	100	Wallflex	29.8	
Own Data	2013	17	76	ultraFlex + polyFlex	42	
Average			89		41.6	

bariatric surgery patients managed with SEMS and SEPS observed an 81 % overall success rate, and a 75 % success rate specific for the LSG group [11].

In this study, there were four patients who unfortunately did not show improvement following stenting. Two of these patients presented within 1 month of the LSG and had high anatomical leaks. One patient had a conversion to roux-en-Y gastric bypass and the other had a roux limb anastomosed to the site of leak, with both patients showing resolution of the leak post-operatively. The third patient also presented within the first month post-LSG but had a low anatomical leak at the antrum. After failure of stenting, the patient was managed with abdominal drains and naso-jejunal feed, eventually attaining leak seal after 60 days. The last patient presented to our facility 2 months after the LSG with a leak fistulating into the pleural cavity. Unfortunately, after failure of the stenting procedure, the patient traveled to another country to seek further medical assistance and was lost to follow-up.

One interesting endoscopic finding that appeared in most patients with post-LSG leaks who underwent stenting in this study was significant angulation at the incisura of the stomach. This finding, we believe, might play a key role in the pathophysiology behind the leak by increasing the gastric pressure proximally. This finding warrants further attention and care by the operating surgeon.

There are currently a multitude of methods for treating LSG leaks including reinforcing the suture line by over-sewing, biological glues, re-laparotomy or laparoscopy with abdominal washout and leaving a drain in situ, pigtail drains, clips, percutaneous drainage alone, and conversion to RYGB, but there has yet to exist a general consensus regarding which technique is optimal [12, 13]. This study shows that endoscopic stenting can play a major role in treating staple line leaks post-LSG. More research comparing different methods with larger sample sizes, however, is needed to better determine an optimal solution.

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