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Endoscopic stenting for laparoscopic sleeve gastrectomy leaks

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ABSTRACT

Objective: Laparoscopic sleeve gastrectomy is a widely accepted and effective bariatric surgery method. The rate of leakage at the staple-line has been reported to be between 1.5 and 5%. Aside from the use of percutaneous drainage, re-laparoscopy, or abdominal sepsis control by laparotomy, endoscopic esophagogastric stent placement is increasingly preferred as a treatment method. Because laparoscopic sleeve gastrectomy is a widely used modality in our hospital, we aimed to evaluate the rate of leaks and the results of stent placements in our patients.

Material and Methods: Between January 1st 2010 and August 31st 2014, laparoscopic sleeve gastrectomy was performed on 236 patients by three surgeons. The demographic information and postoperative discharge summaries were collected and analyzed with the permission of the hospital ethics committee. Information about leak treatment management was also collected.

Results: Leaks after laparoscopic sleeve gastrectomy in four patients were stented in the first postoperative month. Short (12 cm) Hanora® (M.I.Tech, Gyeonggi-do, Korea) self-expandable coated stents were placed in two patients, and long (24 cm) Hanora® self-expandable coated stents were placed in the other two. The stents were removed after one month in two patients, two and a half months later in one, and five months later in another patient. The leaks were demonstrated to be healed in all patients after stent removal. Endoscopic stent revision was performed in one patient due to migration of the stent and in another for stent breakage.

Conclusion: The success rate of treatment of leaks after laparoscopic sleeve gastrectomy by stent placement has been variable in the literature. The success in early stent placement has been shown to be related to physician expertise. According to the results of our patients, we suggest that endoscopic stent placement in the early stage after controlling sepsis is an effective method in the management of leaks.

Keywords: Complications, endoscopic, fistula, laparoscopic sleeve gastrectomy, leak, management, stent

INTRODUCTION

Laparoscopic sleeve gastrectomy (LSG) is accepted as a successful stand-alone surgical treatment for obesity (1, 2). Surgery is an effective method to decrease excessive weight and improve survival against obesity-related morbidity and mortality (3). LSG provides continuity of the gastrointestinal system and maintains the antrum, thus preventing dumping syndrome. It also does not leave foreign material within the patient, such as with gastric banding (4). Due to these advantages and the relative simplicity of the procedure, surgeons use LSG more frequently than the other methods. However, the procedure is not free of complications. Bleeding, strictures, and staple-line leaks may occur. The rate of staple-line leaks varies between 1.5 -5.3% of all patients who undergo the LSG procedure, and if the leak is not detected quickly and managed properly, the patient may experience abdominal sepsis or even death (2).

Stents have been used in the gastrointestinal system for a long time. Covered self-expandable metallic stents (CSEMS), designed for bariatric surgery, are the new armamentarium of the endoscopist in the management of staple-line leaks (5-7).

Because LSG is a widely used modality in our hospital, we aimed to evaluate the efficiency of self-expandable coated stents in the treatment of leaks.

MATERIAL AND METHODS

Between January 1st 2010 and August 31st 2014, LSG was performed on 236 patients by three surgeons in a single surgery unit. Written informed consent was obtained from each patient. Data regarding demographic and anthropometric characteristics, operation discharge summaries, and leak treatment management were extracted and analyzed with the permission of the Fatih Sultan Mehmet Training and Research Hospital Ethics Committee, Istanbul.

Surgical Procedure

A 5-trocar technique was employed for LSG. A midline epigastric 12 mm optical trocar was inserted 25 cm from the xiphoid process. Next, under laparoscopic view, 2 working trocars were inserted (5 mm

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on the left and 12 mm on the right) on each mid-clavicular line just above the optic trocar level. A sub-xiphoid 5 mm trocar was used to elevate the left lobe of the liver, and a 5 mm anterior axillary subcostal trocar was used to retract the stomach. The omentum was liberated from the greater curvature with the help of a vessel sealing device. Starting 5 cm proximally from the antrum towards 1 cm lateral to the gastro-oesophageal junction, the stomach was divided by a multiple-firing endoscopic linear stapler device. A standard leak test was performed in all LSG patients by instillation of 50 mL standard 0.9% NaCl solution with methylene blue (10 mL methylene blue in 500 mL 0.9% NaCl), and then 50 mL air was given through an oro-gastric tube. A drain was placed in the left lateral quadrant. All the patients in this case series tested negative for leaks. On postoperative (p.o.) day 1, all patients were given an oral methylene blue test and were then placed on a clear liquid diet. They were discharged on postoperative day 3 under normal circumstances.

Endoscopic Stenting

All endoscopic procedures were performed under deep sedation provided by the anesthesiologist. Endoscopy and stenting were performed using a single channel gastroscope (EG-450 gastroscope; Fujinon, Japan). A stiff but flexible guide wire was placed under direct vision further from the duodenal bulb and was used to introduce the stent. Two different sized stents were used. Either a Hanora® (M.I.Tech; Gyeonggi-do, Korea) CSEMS measuring 24 cm in length and 22 to 30 mm in diameter, which is specially designed for the sleeved stomach, or a 12 cm in length and 22 mm in diameter oesophageal stent was placed. The stents were positioned starting 5 to 10 cm proximal from the point of the detected leak onwards into the stomach if an oesophageal stent was used or into the duodenal bulb if the bariatric stent was used. The final position of the stent was checked as the endoscope passed through.

RESULTS

Staple line leaks were detected in 8 out of 236 patients (3.3%). Leaks were initially managed either by re-laparoscopy aiming to control abdominal sepsis and suture repair of the defect if possible, or by percutaneous drainage and fistula management with total parenteral nutrition (TPN). Primary repair attempts failed in all but one patient whose leak was obvious on p.o. day two. Percutaneous drainage and TPN was required for fifty-five days for the leak to close completely in one patient, while another patient died due to fungal sepsis after two months. Endoscopic self coated stents were applied to the remaining four patients. Characteristics of the patients, symptoms, time until the leak was discovered, management, and stent duration are shown in Table 1.

Case 1

A 34-year-old female was operated on for morbid obesity. Her body mass index (BMI) was 43 kg/m^2. A 1 cm defect that developed in the staple-line near the fundus due to stapler misfiring-misclosure was corrected by re-stapling and incorporating the defect within the removed area of the stomach. The patient complained about difficulty in breathing on p.o. day 1 that worsened with persistent tachypnea and left shoulder discomfort. A computed tomography (CT) scan of the thorax revealed a left pleural effusion and a left basal atelectasis, but no collections were observed in the abdomen. On p.o. day 6, she had to be intubated for respiratory stress and was admitted to the intensive care unit. A second CT showed contrast extravasation and collections around the stomach that were drained percutaneously. Gastroscopy was planned on p.o. day 28 and showed a leak at 38 cm. A 12 cm Hanora® (M.I.Tech; Gyeonggi-do, Korea) oesophageal stent was placed. Two days later, a control endoscopy revealed distal migration of the stent. After repositioning, a second stent was inserted through the first one and was opened just overlying its distal end so that they were overlapping by 2-3 cm. The distal tip of the second stent rested on the antrum. Stents were left in place for 2.5 months and then removed once the leak had healed.

Case 2

A 29-year-old female patient with a BMI of 41.1 kg/m^2 underwent LSG to treat morbid obesity. The patient was discharged three days after the procedure and was placed on a clear liquid diet. She had no complaints at the first week appointment, but two days later, she was admitted to the emergency department with abdominal pain, nausea, tachycardia, and tachypnea. An abdominal CT scan showed contrast extravasation antero-inferiorly around the sleeved stomach near the splenic upper pole. The patient was taken to the operating room for laparoscopic exploration, and a proximal gastric leak was detected near the resected fundus. The opening was sutured, and the abdomen was drained. Due to continuous drainage on p.o day 15, an oesophageal stent was placed to cover a leak at the gastro-oesophageal junc-

Table 1. Characteristics of the patient with symptoms and time of the leak discovered

Age/Gender	BMI	Symptoms	Time to leak discovered	Management	Stent duration
34/Female	43	Tachypnea, Tachycardia, Left shoulder pain	6 days	Percutaneous drainage, Stent (12 cm)	10 weeks
29/Female	41	Abdominal pain, Nausea-vomiting, Tachycardia	9 days	Re-laparoscopy, Sewing the leak (failed), Stent (12 cm)	28 days
27/Female	43	Abdominal pain, Nausea-vomiting, Tachycardia	10 days	Relaparoscopy, Sewing the leak (failed), Stent (24 cm)	32 days
23/Male	46	Tachypnea, Tachycardia, Left shoulder pain	2 days	Relaparoscopy, Sewing the leak (failed), Stent (24 cm and 12 cm)	50 days

BMI: body mass index

Figure 1. a-c. A staple-line leak near the gastroesophageal junction (a). The stent was introduced over a guide wire placed under direct vision (b). Then, the stent was opened to cover the leak (c)

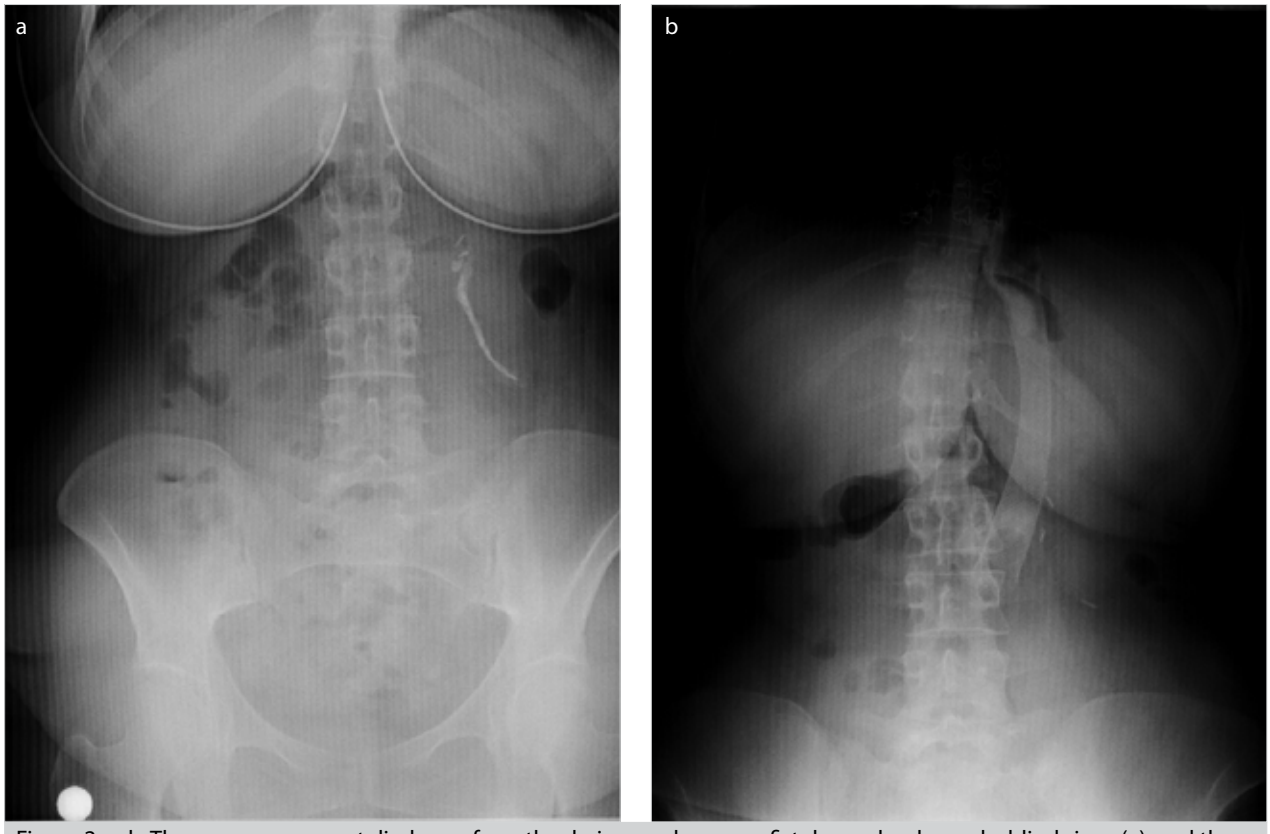

Figure 2. a, b. There was a recurrent discharge from the drain area; however, fistulography showed a blind sinus (a), and the stent was in proper position (b)

tion (Figure 1a-c). The stent was removed on the 28th day because of worsening retrosternal pain and odynophagia, and the leak was found to be closed. A serous discharge recurred occasionally at the drain area, but a fistulography showed a dead-end sinus (Figure 2).

Case 3

A 27-year-old female patient underwent LSG to treat morbid obesity (BMI: 43.2 kg/m^2). The surgery was uneventful, and leakage tests were negative. The postoperative period was normal, and she was discharged on p.o. day 3. After a one-week oral intake of the prescribed liquid diet, she complained of nausea and vomiting and was readmitted to the surgery ward with abdominal pain, low grade fever, and tachycardia. An abdominal CT scan revealed three closed collections, the largest measuring 2 cm in diameter, between the anterior surface of the sleeved stomach and the left lobe of the liver. She was put on broad-spectrum antibiotics and total parenteral nutrition. However, three days later, she deteriorated, and a second abdominal CT revealed widespread fluid in the abdominal cavity (Figure 3). She was taken to the operating room for laparoscopic exploration, and the abdominal cavity was irrigated. Methylene blue tests showed a leak near the proximal stomach close to the gastro-oesophageal area. The omentum was approximated, and an omentoplasty was performed with three interrupted sutures onto the leak. However, suturing failed, and endoscopy revealed a leak at 40 cm. A 24 cm Hanora® (M.I.Tech, Gyeonggi-do, Korea) stent designed for sleeve gastrectomy was introduced under direct vision over a guide-wire to cover the leak from the distal oesophagus to the duodenal bulb. Due to increasing retrosternal discomfort, she was taken back to the gastroenterology unit 15 days later, and the stent was found to have lodged distally even though it was hung by its nasal route wires. It was repositioned, and after one month, the stent was removed to check the leak, which was closed (Figure 4).

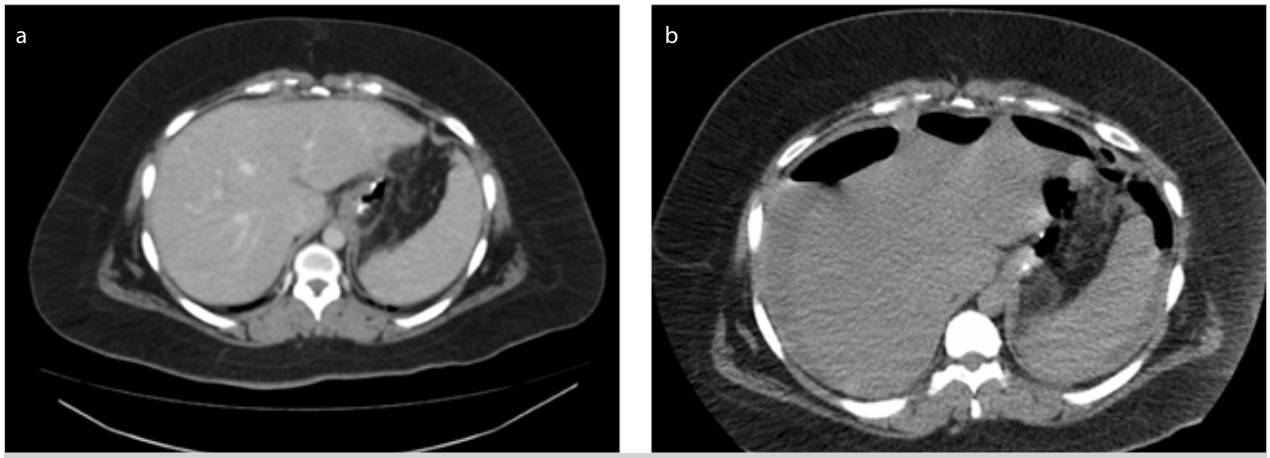

Figure 3. a, b. Initial CT scan showed normal findings (a), but 2 days later, the CT scan detected wide areas of free fluid in the abdomen (b)

Figure 4. a-c. Leaks were closed with exudated floors (a-c). The stapler (b) and suture material (c) were visible in the oesophageal lumen

Case 4

A 23-year-old male patient underwent an operation to treat morbid obesity (BMI: 46 kg/m^2). The calibrating oro-gastric tube was incidentally compressed between the stapler jaws and cut unintentionally, while applying the stapler to the antrum. The opening was closed by applying another row of staples, and a leakage test showed no extravasation of the dye. The patient was in distress the next day with tachypnea, tachycardia, and upper left shoulder pain. An abdominal CT scan was ordered and revealed widespread abdominal fluid with contrast extravasation. The patient was taken back to the operating room for irrigation and an oesophago-gastric perioperative contrast study, which revealed a dilated oesophagus and a thin contrast passage into the stomach without extravasation. Four days later, he was still under respiratory distress and was febrile with turbid abdominal drainage. Another operation was performed. The methylene blue test found a fundic leak that was sewn up with interrupted 2/0 absorbable sutures. However, suturing did not reduce the drainage. Twenty-five days after the initial LSG operation, he was found to have a leak at 45 cm, just 3 cm beyond the gastro-oesophageal function. A Hanora® (M.I.Tech, Gyeonggi-do, Korea) stent designed for sleeve gastrectomy was placed that decreased the drain output effectively. Although the stent was secured through nasal slings around the auricle as a spectacle, it was found to migrate distally and was repositioned after 10 days. However, the drain output continued to increase, and we decided to remove the 'non-functioning' stent after 20 days. The stent was found to be kinked in the incisura angularis, and the silicon coating in the kinked part was defective. Due to the migration problem, this error could not be properly prevented even with the slings and probable kinking. We chose to recover the leak with a shorter 12 cm long, 22 mm diameter coated stent. The patient tolerated feeding without increased leak output, and 30 days after the second stenting, we removed the stent and found the leak to be healed.

DISCUSSION

Despite the technical simplicity of the procedure, staple-line leaks are life-threatening complications that occur in approximately 5% of LSG cases (8-10). Symptoms may be gradual or sudden. Different methods of management have been used to treat the leaks. Patients need to be put on broad-spectrum antibiotics and total parental nutrition, and their collections should be drained either percutaneously or surgically. Leaks can be defined as early (1-3 days p.o.), intermediate (4-7 days p.o.), or late (after 8 days p.o.), and suturing of the leaks did not provide success in case series in either early or intermediate term (9, 11).

Covered self-expandable metallic stents have gained popularity in the management of leaks with variable results (5-10, 12). In our study, we obtained complete closure of the leaks by using variable length SECS. Serra et al. (13) used CSEMS in 5 patients and reported leak closure in four of them. They also used a wall stent in another patient, but due to the mucosal enlargement through the stent and resulting obstruction, they had to perform a total gastrectomy. In another small case series by Casella et al. (14), complete healing occurred in 3 patients with staple-line leaks by using CSEMS.

Figure 5. a-c. Mucosal ingrowth through the distal portion of the stent

Additionally, in the largest case series, Tan et al. (7) reported a 50% closure rate.

Different sizes and lengths of CSEMS are available. There are also custom tailored stents for bariatric surgery. Galloro et al. (5) reported a mega stent in four patients and closure of the leaks within a shorter period of time and with less intolerance. Additionally, they did not report any stent migration. We also used tailored-to-fit sleeved stomach stents in 2 patients. These new stents were placed from the distal oesophagus above the leak to the duodenal bulb where they were seated. The proximal diameter of the stents in the oesophageal part was 22 mm, and the distal stomach part had a diameter of 30 mm so that the leak area was bypassed and the stent would have difficulty to migrate distally. Unfortunately, larger stents did not prevent migration. Although the long stents we used had additional anchoring wires, they migrated as the short stents did. Stent migration has been reported frequently in the literature and is a complication that requires re-interventions (8, 15). In our patients who encountered stent migration, we either had to change or reposition them.

Kinking was another significant problem with long stents. Kinking was diagnosed when we noticed increased drainage and we had to change the stent. Mucosal ingrowth through the distal portion of the stent was observed in both patients treated with long stents (Figure 5). Patients who remained asymptomatic raise the question of whether ingrowth has any clinical implication or not. The clinical importance of this problem should be assessed in larger case series.

CONCLUSION

This case series showed that staple-line leaks after LSG can be successfully managed by using CSEMS following the timely control of abdominal sepsis. Further prospective studies including larger number of patients are needed in order to explore the benefits and complications of stents in staple-line leaks after LSG.

Limitations of our study include the retrospective design and small patient population. There were not enough patients to adequately compare short and long stents in terms of complications and effectiveness. Such comparisons need to be assessed in larger case series.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Fatih Sultan Mehmet Training and Research Hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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