



Endoscopic Self-Expanding Metallic Stent Placement in the Management of Post Laparoscopic Sleeve Gastrectomy Complications

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Abstract

Introduction Endoscopic treatments have become popular by providing the best solution for healing complications while allowing oral nutrition. In this study, we aim to evaluate outcomes of the endoscopic-covered stents for staple line complications following bariatric surgery.

Methods A prospective evaluation was performed for all patients treated for staple line complications after bariatric surgery. Bariatric patients with acute leaks, chronic gastrocutaneous fistulas, and anastomotic strictures refractory to endoscopic dilation after sleeve gastrectomy were included in this survey.

Results From January 2019 to June 2020, 41 patients (12 with acute leaks, 16 with chronic fistulas, and 13 with strictures) were treated with endoscopic silicone-covered stents (polyester or nitinol). The mean follow-up was 3.5 months. Immediate symptomatic improvement occurred in 95.2% (91.7% of acute leaks, 81.2% of fistulas, and 92.3% of strictures). In addition, 87.8% of patients initiated oral feeding immediately after stenting. There was no mortality case in this population.

Conclusion Although stent migration rarely occurs in subjects, the endoscopic silicone-covered stents strategy is one of the best treatments for anastomotic complications after bariatric surgery, providing rapid healing while simultaneously allowing for oral nutrition.

Keywords

- ▶ endoscopic treatment
- ▶ bariatric surgery
- ▶ leakage

Introduction

Bariatric surgery can effectively reduce the mortality risk of obesity-related and nonobesity-related comorbidities.^{1,2} However, it has postoperative anastomotic complications or staple line leaks. Based on reports, 1 to 5% of patients are diagnosed with these complications after bariatric surgery.³

A combination of surgical or percutaneous drainage and exclusion of the leak site has been established for the treatment of anastomotic leaks.^{4,5} The best option for strictures treatment at the gastrojejunostomy is endoscopic dilation. Although endoscopic dilation is the best option, multiple dilations are often required, and in some strictures, revisional bariatric surgery will be needed.⁶ Successful endoscopic stenting of anastomotic leaks after esophageal

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resection has been described.^{7,8} Meanwhile, most surgeons are trying to find less invasive methods to treat anastomotic complications, thus allowing patients to have improved oral enteral nutrition. Currently, the most popular stents are made either of nitinol (Alveolus Inc., Birmingham, AL, USA) or polyester (Polyflex, Boston Scientific Inc.), which are removable and have silicone covers.^{9,10} Several reports demonstrated the benefits of stents in treatment of anastomotic leaks after bariatric surgery.^{4,11–14} The main aim of this study was to have a deep look into the impacts of endoscopically placed self-expanding metallic stents (SEMS) on the treatment of various anastomotic complications after bariatric surgery.

Methods

This prospective study gathered crucial information from 41 individuals who underwent an operation for endoscopic SEMS to treat postoperative complications of laparoscopic sleeve gastrectomy (SG) from January 2019 to June 2020. Laparoscopic SG was performed for all individuals based on the standard protocol approved by the American Society for Metabolic and Bariatric Surgery.¹⁵

Bariatric patients with acute leaks, chronic gastrocutaneous fistulas, and anastomotic strictures refractory to endoscopic dilation after SG were included in this survey. The study was a single-center study, approved by the Review Board of Erfan Hospital. Complications were refractory anastomotic strictures, chronic gastrocutaneous fistulas for more than 3 weeks, or acute staple line leaks.¹⁶ External drainage was considered, and stents were placed within 1 day of identification for all cases diagnosed with acute leaks by the same surgeon and clinical team. Endoscopic and laparoscopic guidance was considered to place SEMS. Primarily, we used endoscopy to determine the leak or stricture area. A radiopaque marker was used to mark the target area. Then, water-soluble contrast was injected into the mucosa adjacent as an internal marker, which is a more accurate marker, with less variability from breathing and movement. An 18-mm balloon was used to identify and dilate strictures for at least 3 minutes. The endoscope was then removed, and fluoroscopy was used to position the stent across the leak or stricture using the guidewire and radiopaque marker to position the stent properly. We used nitinol (Alveolus Inc.) and polyester (Polyflex, Boston Scientific Inc.) silicone-covered stents in subjects and were chosen based on availability and surgeon preference for our cases in this study.

An upper gastrointestinal contrast study was done the day after the operation. Sleeve leakage is categorized as an acute leak within 7 days, early leak within 1 to 6 weeks, late leak after 6 weeks, and chronic leak after 12 weeks. In patients with no symptoms of leakage, a supervised diet was initiated. Also, all patients had clinical screening 10 to 14 days after stent placement, and an abdominal radiograph was performed to determine the position of the stent. For suspected patients, esophagogastroduodenoscopy and upper gastrointestinal contrast studies were performed. Anastomotic leak healing was defined as the absence of contrast extravasation

from the bowel when the stent was removed. The ability to tolerate a regular diet after stent removal was considered stricture healing.

Results

Forty-one out of 685 patients were diagnosed with staple line complications following SG during the study period treated with endoscopic SEMS. All endoscopic complications that occurred after SG and patients undergoing other types of bariatric surgery were excluded from the survey. Blood samples were collected from patients and routine biochemical parameters were performed for all 41 patients. More details on the biochemical profiles of patients can be found in ►Table 1. Following the short operation, sixteen patients with chronic gastrocutaneous fistulas, thirteen with anastomotic strictures, and twelve with acute anastomotic strictures were diagnosed. ►Table 2 illustrates clinical information regarding the subjects and the outcomes of the results. The symptoms of nausea and pain were declined in 75% of individuals, and 70% of subjects started oral nutrition following the operation. The rest of the subjects who were not immediately given oral nutrition were intubated at stenting, and oral nutrition was started after extubation.

Thirteen patients out of 16 (81.2%) had complete improvement in the chronic fistula population and initiated immediate oral nutrition after surgery. Following stent treatment, 12 of 13 patients (92.3%) illustrated complete healing of their stricture. Among subjects with acute leakage, 11 of 12 cases

Table 1 Biochemical levels in serum of 41 patients

Parameters	Reference value	Mean ± SD
SGOT	0–42 IU/L	28.7 ± 3.2
SGPT	0–42 IU/L	26.3 ± 7.8
FBS	70–100 mg/dL	151.3 ± 34.7
HbA1c	Nondiabetic < 5.7% (39 mmol/mol) 5.7% ≤ prediabetes ≤ 6.4% (46 mmol/mol) Diabetic ≥ 6.5% (48 mmol/mol)	7.6% ± 3.2
Cholesterol	40–200 mg/dL	273.1 ± 42.8
Triglyceride	40–200 mg/dL	229.2 ± 83.1
HDL	30–70 mg/dL	40.8 ± 9.8
LDL	40–130 mg/dL	84.2 ± 9.3
BUN	7–20 mg/dL	22.1 ± 4.9
Creatinine	0.5–1.0 mg/dL	1.14 ± 0.27
ALP	Female: 64–36 IU/L Male: 80–306 IU/L	167.9 ± 36.9 170.2 ± 38.3

Abbreviations: ALP, alkaline phosphatase; BUN, blood urea nitrogen; FBS, fasting blood sugar; HbA1c, hemoglobin A1c; HDL, high-density lipoprotein; LDL, low-density lipoprotein; SD, standard deviation; SGOT, serum glutamate-oxaloacetate transaminase; SGPT, serum glutamic-pyruvic transaminase.

Table 2 Demographic data and initial response to SEMS treatment

Complications	n	Gender (males: females)	Mean age (year old)	Symptomatic improvement (%)	Immediate oral nutrition (%)
Chronic fistula	16	10:6	51	13 (81.2)	16 (100)
Stricture	13	2:11	46	12 (92.3)	11 (84.6)
Acute leak	12	5:7	48	11 (91.7)	9 (75)
Overall	41	17:24	48	36 (87.8)	36 (87.8)

Abbreviation: SEMS, self-expanding metallic stents.

(91.7%) were completely improved after the operation and 9 patients out of 12 (75%) started oral nutrition following surgery. In conclusion, 36 out of 41 individuals (87.8%) involved in this study demonstrated a complete symptomatic improvement and initiated immediate oral nutrition following surgery (►Table 2).

Mean SEMS duration was 25 days, and diagnosis of healing was documented by radiographic imaging, which occurred in the outpatient setting an average of 6 days after stent removal. The results of late outcomes after stent treatment were presented in ►Table 3. It was observed that 9 out of 41 individuals illustrated minor complications because of stent migration. All patients recovered without serious complications. A total of 41 stents were placed, twenty-six were polyester-based (Polyflex, Boston Scientific Inc.), and fifteen were nitinol-based (Alveolus Inc.). SEMS migration was observed in 9 (21.9%) patients, consisting of five subjects with nitinol-based SEMS and four with polyester-based SEMS.

Discussion

Gastrointestinal leakage usually presents as an immediate postoperative complication following bariatric surgery.^{15,17} Therefore, signs and symptoms of leakage, including a drop in hemoglobin levels, hematochezia, hematemesis, or melena, should be considered for further evaluations.^{18,19} On the other side, endoscopy is often performed as a routine diagnostic method to investigate of the leakage source.¹⁷ However, surgical re-exploration may be required in severe postoperative bleeding cases and when hemodynamic instability is

possible in subjects.²⁰ Researchers believe that anastomotic bleeding is the most frequent complication along staple lines after bariatric surgery.^{21,22} Postoperative leakage among SG patients is occurred often at the esophagogastric junction and may be secondary to stenosis at the incisura.^{23,24}

Although the main reasons and risk factors of leakage remain unclear, leaks may depend on technical factors, including anastomotic tension, tissue ischemia, and size of the staple line, tissue thickness, and blood supply.¹¹ Moreover, some researchers believe that leaks are linked to significant morbidity and mortality rates.^{19,25} The overall incidence of an anastomotic leak following bariatric surgery is reported as approximately 2.4% among SG patients.²⁶ As surgeon experience with the laparoscopic approach increases, the rate of anastomotic leakage is often declined.^{3,27} Therefore, endoscopic SEMS treatment could have a crucial impact on the management of anastomotic complications after SG.²⁸ Standard treatments are time-consuming and can lead to substantial morbidity, including patient discomfort and decreased quality of life.²⁹ Therefore, it is almost acceptable by surgeons that SEMS might shorten hospital stays and reduce complications of specialized feeding.⁵ Based on our results, excellent outcomes were observed in treatment of refractory strictures. While subjects had multiple endoscopic dilations for debilitating strictures with poor results, individuals could not tolerate solid food before SEMS treatment, and only a liquid protein was their common meal.^{30,31} After SEMS treatment, all but one patient tolerated a solid bariatric diet after a mean follow-up of 3.5 months. The hypothesis is that the SEMS declines wound contraction and improves the overall diameter of the

Table 3 Late outcomes after SEMS treatment

Complication	Mean stent duration, d	Mean time to healing, d	Healing rate, %	Complication rate, %	Mean follow-up, mo
Acute leak (n = 12)	27	29	11 (92)	8.3	5.1
Chronic fistula (n = 16)	24	37	14 (87.5)	12.6	4.7
Stricture (n = 13)	25	35	9 (62.2)	38.5	3.6
Overall (n = 41)	25	34	34 (82.9)	19.8	3.5

Abbreviation: SEMS, self-expanding metallic stents.

anastomosis. The type of stent used for subjects had no significant effects on complication rate or symptomatic improvements in this study. The smaller diameter of the delivery system designed in the metal stent makes it easier to place across tight strictures.^{6,32}

Of 41 patients, 9 cases (21.9%) experienced SEMS migration and there was no significant difference in the SEMS migration rate between nitinol-based SEMS and polyester-based SEMS. The strengths of this study are the large target group and being a single-center study with a similar surgeon and clinical team. As mentioned, a surgeon's experience and promptitude with the laparoscopic approach are principal factors involved in the rate of anastomotic leakage. That was the main reason for conducting this survey as a single-center study. The principal weakness of this report is the short follow-up time. Also, further studies are required to confirm the results of this report.

Conclusion

SEMS are safe and effective in the treatment of staple line complications that happen among bariatric subjects. These stents can provide rapid healing while simultaneously allowing for total oral nutrition. Leaks, fistulas, and strictures are amenable to stent treatment. The SEMS migration rate is of major concern and may potentially require surgical removal. Additional studies to evaluate new stent design or placement techniques are needed to address the high migration rate.

Authors' Contributions

HG and MH designed and collected the data, JO analyzed the results, and TA and HG performed and wrote the draft.

Availability of Data and Materials

Readers can reach the data and materials through direct contact with the correspond author's email.

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None.

Consent for Publication

Not applicable.

Conflict of Interest

None declared.

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