

Staple-line leak after sleeve gastrectomy in obese patients: A hot topic in bariatric surgery

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Abstract

Laparoscopic sleeve gastrectomy is a surgical procedure that is being increasingly performed on obese patients. Among its complications, leaks are the most serious and life threatening. The placement of esophageal, covered, self-expandable metal stents in these cases has been performed by many authors but reports on the outcome of this procedure are limited and the technical aspects are not well defined. Stent migration is the main complication of the procedure and poses a challenge to the surgeon, with a limited number of options. Here we evaluate the technical and clinical outcome of a new, dedicated, self-expanding metal stent, comparing the advantages of this stent to those traditionally used to treat staple-line leak after sleeve gastrectomy. While published data are limited, they seem support the use of this kind of new stent as the best option for the stenting treatment of a staple-line leak after sleeve gastrectomy, over other kinds of stents. Further studies based on larger series are needed to better evaluate patient outcome.

Key words: Bariatric surgery; Leak; Obesity; Sleeve gastrectomy; Endoscopic stent; Therapy

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Core tip: Laparoscopic sleeve gastrectomy (LSG) is a surgical procedure increasingly performed on obese patients with convincing outcomes. Among its complications, leaks are the most serious. The use of esophageal self-expandable metal stents in these cases has been performed by many authors but reports are limited and stent migration is the main complication of the procedure. Megastent®, a new stent dedicated to the treatment of leaks after LSG, seems to resolve most of the problems of the esophageal stents. While published data are limited, they seem support the use of Megastent® as the best option for the stenting treatment

of a staple-line leak after sleeve gastrectomy. Further studies on larger series are needed to better evaluate definitive outcomes.

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A HOT TOPIC IN BARIATRIC SURGERY: NEW DEDICATED STENTS TO IMPROVE TREATMENT

Laparoscopic sleeve gastrectomy (LSG), first described by Gagner^[1] in 2003, has become a well standardized therapeutic option for the surgical treatment of different degrees of obesity^[2-6]. Since its introduction, LSG has gained acceptance due to its technical simplicity and the convincing outcomes^[7,8]. While specific complications have been reported, including staple-line bleeding and stricture, staple-line leaks are the most serious as they are associated with the greatest morbidity. The incidence of this type of leak after LSG varies in different series^[9-11] and its management has been attempted using several different therapeutic approaches^[7,10,12-21].

Staple-line leak after LSG reportedly develops in 2.5% of patients undergoing primary sleeve gastrectomies, with a range between 0.5% and 7% in the different series of dedicated bariatric surgeons^[6,7,10,16,22,23]. Recently Gagner^[24] reported that the incidence of staple-line leak after LSG is decreasing from a generally accepted rate of 2.5% initially to a now 1.1% leak rate in 2013 as reported in a large cohort of 46.133 sleeve gastrectomies, with more than 50% decreased incidence.

Nevertheless, in our opinion, the true rate is probably underestimated. A detailed review by the American Society for Bariatric and Metabolic Surgery reported an overall complication rate after LSG of 0%-24%, with the leakage occurring in 16%-20% of the cases in several series of different experienced surgeons^[16] and in patients requiring re-operation after a previous gastric operation performed in no-dedicated to bariatric surgery centers^[25].

The gastro-esophageal junction and the proximal stomach near the angle of His are, according to the literature, the most frequent origins of leaks^[6,9,11,15], but the reason for this predominance is still unknown. Baker^[26] suggested that staple-line leaks are secondary to an impaired healing process and may have multiple risk factors (impaired suture-line healing, poor blood flow, infection, poor oxygenation with subsequent ischemia), but these can be divided into two main categories: mechanical-tissue causes and ischemic causes.

A mechanical mechanism can be invoked when

the intraluminal pressure, in association with a low compliance of the gastric tube, exceeds the strength of the staple line. This situation is more likely in patients with difficulties in gastric emptying due to a middle or a distal stenosis of the sleeve^[27,28]. In order to reduce the possibility of mechanical failure, the use of buttress material associated with the stapler has been advised, but there is no statistical evidence to support this solution^[29].

On the other hand, some Authors claim that most fistulas are not due to staple failure and dehiscence but to ischemia in the gastric wall next to the staple line, likely reflecting devascularization of the gastro-esophageal junction during liberation of the greater curvature or dissection of the greater curvature when electrocautery, Ultracision®, or the LigaSure® system is used^[30,31].

Moreover, regardless of the mechanism (mechanical or ischemic) the physiology of the normal sleeve must be considered as well. Studies assessing volume and pressure after LSG^[28,32] clearly demonstrated that the removed portion of the stomach (fundus and corpus) is indeed the most expandable, with an important reservoir function. The volume of the sleeve is less than 10% of the volume of the whole stomach and the mean pressure in the sleeve is higher (43 ± 8 mmHg vs 34 ± 6 mmHg, $P < 0.005$). Furthermore, the valve function of the cardia and pylorus persists in the gastric sleeve as does the pumping function of the antrum, both of which may further increase the intraluminal pressure.

For these reasons, in obese patients undergoing LSG, although the high intraluminal pressure resulting from the small volume and reduced distensibility of the sleeve confers early satiety, it is also a risk factor for dehiscence of the staple line.

The use of covered, esophageal, self-expandable metal stents (C-SEMS) in the treatment of staple-line leak after LSG has been supported by many authors in recent years^[15,17,18,31] even if this is not a widely accepted treatment. C-SEMS permit the comfortable management of this complication, as the temporary fistula-bypass enables enteral nutrition (liquid hyperprotein diet progressing to a soft diet as tolerated) and, if the clinical situation is appropriate, allows the patient to return home temporarily^[15]. Nevertheless, reports on the outcome of this procedure are limited and the technical aspects are not well defined.

To select candidates for this form of treatment, the following criteria should be observed: (1) Any abscess or intra-abdominal collection should be previously drained prior to stent placement^[31]; (2) Leaks located at the proximal and mid part of the sleeve are the only ones amenable to stent treatment^[10,11,17,18,21]; (3) The size of the leak should not exceed 2 cm^[17]; (4) The stent should be chosen based on an evaluation of the gastric sleeve diameter, using a larger size in case of doubt, to prevent migration^[17,18]; and (5) Late leaks (persisting for more than 4 wk) have the best outcome^[15,33,34].

Most authors recommend leaving the stent in place

for a period of 6-8 wk.

In the literature, a highly variable success rate has been reported for this technique^[21]. However, most of the published papers have been case reports or small surveys; statistically reliable data are, at this point, lacking.

Stent migration is the main complication of the procedure and it occurs in 30% of the cases in some series^[14,17,18,33] and in as many as 42%-50% in others^[15,20,35]. The highly variable stent migration rate can be explained by the following: (1) These stents are designed for use in esophageal stenosis and have therefore been adapted in a different site and to a different target; (2) The "abnormal" placement of the stent along the last portion of the esophagus and the gastric sleeve does not ensure proper containment of the stent; and (3) The coating of the stents prevents its integration into the stomach wall but reduces the grip on the wall and therefore allows migration along the gastric tube.

Regardless of the cause, failure of C-SEMS treatment poses a challenge to the surgeon, as successful management of the fistula is then very difficult, with a limited number of options.

Recently, Taewoong Medical Industries developed and marketed Megastent[®], a new, fully covered stent dedicated to the treatment of leaks after LSG. Its features resolve some of the above-mentioned problems. The proximal and distal ends of the stent are slightly flared, with a high edge profile permitting good anchorage. The body of the stent is longer than that of other esophageal stents (15, 18 and 23 cm) thus allowing the distal end (with the same shape as the proximal one) to open into the duodenal bulb. The large diameter (24 or 28 mm) ensures optimal adherence of the stent to the sleeve wall, even in the antral segment, conferring adequate radial strength to dilate a possible stenosis. The entire stent is coated, which prevents its integration into the stomach wall due to a granulomatous reaction while the flexibility of the stent nets is sufficient to allow adaptation of the stent to the post-operative anatomy of the gastric sleeve.

In our experience^[36], stents 230 cm long and 24 mm in diameter were chosen. The shape of the proximal end of the stent and its angle with respect to the stent body allowed complete coverage of the leak, thus promoting healing. Moreover, the total length of the stent facilitated delivery of the proximal end into the distal esophagus and the distal end into the duodenal bulb, such that the stent body extended through the entire sleeve. In our opinion, this is the main advantage of the Megastent[®], as this feature eliminates the pressure gradient in the gastric sleeve. Thus, by establishing a communication with the esophagus and the duodenum, the Megastent[®] completely resolved the high-pressure condition that had developed in the gastric sleeve, thus promoting healing of the leak hole. The absence of stent migration was likely due to the fact that the length and diameter of the stent allow it to firmly grip the entire gastric sleeve, despite its full-

length coating.

In our patients one week after the stent placement a liquid high protein diet was started, followed by a soft diet and discharge 3 d later. The stent was removed after 8 or 9 wk and an upper endoscopy documented complete healing of the leak.

While the procedure described herein was successful, two problems arose during and after stent placement. The first was biliary vomiting, which the patient experienced during the treatment. Pharmacologic therapy with domperidone was mandatory, to reduce the symptoms, which were due to esophageal biliary reflux. The second problem occurred after stent removal: a decubitus lesion in the duodenal bulb that arose, in our opinion, from the decubitus of the free edge of the distal end of the stent, strained by the radial strength of the net.

In conclusion, we recommend that the complicated multi-disciplinary management of patients with gastric leakage treated by stent graft should be confined to specialized centers. Stent placement, in appropriately selected patients, is a safe and effective treatment for staple-line leaks after LSG. This minimally invasive technique has an acceptable complication rate and causes little discomfort to the patient, who avoids the need for more invasive procedures or even total gastrectomy.

Published data about Megastent[®] are limited but very interesting and encouraging. I like to close this article citing the words by Gagner^[24] on a his recent editorial: "I project that staple line leaks will continue to decrease. However, it may never be eliminated completely and nonoperative treatment with endoscopic fully covered metallic stent placement will continue to be the best method in leaks < 12 wk. If the long stents advoked by Galloro *et al.*^[36] will solve the migration problem seen in earlier series, as well as take care of the mid-body stricture often associated, then we might see less fistula-jejunostomies in the near future".

Obviously, further studies based on larger series are needed to better evaluate patients outcome.

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