A new approach to Laparoscopic Gastric Sleeve leaks. A literature review

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Abstract

The aim of this article is to report a case of antral leakage after a Laparoscopic Vertical Gastrectomy (LVG) or laparoscopic gastric sleeve (LGS) that was successfully managed by transforming the leak into a gastrostomy with a Foley drain using the rendez-vous technique as naso-gastric-leak guide. In order to manage this kind of leakage conventionally, the cooperation of surgeons and interventional radiologists is necessary. After the reviewing the literature and from our own experience, we propose a new conventional non-surgical algorithm treatment for gastric leakage after LGS

KEYWORDS: Vertical gastrectomy leaks; Gastric Sleeve leaks; conservative treatment; rendezvous technique.

Background

In Europe, Laparoscopic Vertical Gastrectomy (LVG) or Laparoscopic Gastric Sleeve (LGS) is swiftly replacing gastric bypass [1,2]. Actually, it is the most commonly performed restrictive bariatric procedure. Increasing patient numbers and longer periods of follow-up allow us to better evaluate leak complications of this relatively new operation. Leaks reportedly occur between 0.9 and 9 % of the series (1,3,4) and even more often in revision cases [2,5]. The majority of leaks appear around the gastro-esophageal junction (GEJ) (80-90%), close to the His angle. They less commonly occur at the antrum (10-20%) [6]. These leaks are known to be difficult to treat by conventional means. In prospective studies, the leak rate after GS appears to be rather high, up to more than nine percent [1]. In recent literature, it appears that the more conservative treatment of this complication offers better results than reoperations, and more importantly, no mortality [3, 7, 8].

Management can be a) Conservative: good drainage by OR drains or scan (CT) guided ones, parenteral antibiotics and feeding; or Naso jejunal or parenteral (NPT) option or b) Surgical intervention over-sewing [9], drainages guided by computerized tomography (CT) scan or open) [10], naso jejunal feeding (NJ) or total parenteral nutrition (NPT) [11], endoscopic clipping [12], fibrin glue [13], stents [14-16], RNY loop and partial [17] or total gastrectomy [18,19].

Prevention should be the aim of this surgery by preventing incisura angularis narrowing, confirmation of no leaks at surgery by (air or methylene blue) testing. Early detection of leaks by high pulse rate, blue drains after daily ingestion of Methylene blue, PCR elevation, chills or fever. NO patient should be discharged with tachycardia. Small leaks, usually at the EGJ can have very significant consequences (20) and is the most severe complication. This is obviously due, in part, to the diminished cardiopulmonary reserve in the morbidly obese and even relatively minor alterations to homeostasis can have significant consequences. Obese patients, however, particularly those with metabolic syndrome, can have an altered immune inflammatory response [6] with higher circulating levels of pro inflammatory cytokines that lead to an exaggerated
systemic response syndrome very rapidly even after minimal peritoneal contamination (20). Most GS leaks close with adequate medical management in less than 43 days. If conservative management fail what is the next step? In this original report we present a novel conservative approach to definitively fix a gastric leakage.

Case report

A 22 year-old man with BMI 60 had a LGS in another Hospital, using a 5-laparoscopic-ports approach, the great gastric curvature was divided far from the pylorus (7 cm) up to the 2-3 cm of the EGJ. A GS was performed with linear stapler, calibrated with a 40 Fr orogastric tube, and a 2-0 running inverting polypropylene stitch. A Jackson tube drainage was left in the left subphrenic space. Blue methylene testing showed no leak.

On POD 2, a pathological secretion from the drainage appeared with an increase in inflammatory markers without any clinical signs of sepsis. The surgical team decided on a revisional surgery, suspecting a small perforation in the gastric tube. They found peritonitis and a small defect in the antral staple line, proceeding to sew over the small defect with a single stitch, and a pyloroplasty and multi-tubulated Penrose drainage.

A leak was shown by a contrast CT scan by POD 7. The patient was clinically septic and TPN and systemic antibiotics were given. Then he was moved to the ICU of our Hospital. The CT scan was repeated and the antral leakage had increased with a 6x5 cm sub hepatic collection without air bubbles, bilateral pleural effusion and atelectasis.

Then the surgeon changed the Penrose drain for a Foley 20 Fr at the patient’s bedside, in order to improve the drainage, then saliva and bile started to collect. After a few days, a naso-gastric tube was put in place to remove the saliva, but the abdomen radiology test showed that possibly the tube had move directly through the antral leak opening (Fig. 1).

At the discretion of interventional radiology service and previous Informed Consent (IC), a guide was passed through the naso-gastric tube into the path of the leakage opening. The Foley 20 Fr tube drainage was removed and through the naso- gastric tube, which extreme was located on the antral leak, a guide was introduced. Then, with contrast, its location was verified and, using this guide, another guide was introduced to reach the exterior abdominal drainage hole (Fig. 2).

A Foley 16 Fr tube was prepared cutting its tip minimally to pass the guide through it and with “reunion” technique, the Foley tube reached and passed into the antral hole. Once we verified its location using contrast, the balloon was inflated.

With this procedure a gastrostomy was created and it was fixed to the skin using a slight traction (Fig. 3). The guide inside the Foley Tube (now the gastrostomy) was retrieved to the cardias so it could be reintroduced into the fourth part of the duodenum in order to pass a naso-jejunal enteral feeding tube. After another check using contrast through the gastrostomy showed a good hermetic and non peridrain leaks. Despite that there was no more leak, a Foley 14 Fr was left in place in parallel to collect secretions if it was necessary.

The outcome was favorable except for a fever on POD 7. A CT scan was performed with contrast showing only a liver collection that was drained with a pigtail 10 Fr percutaneous tube, draining a dirty liquid initially and bloody subsequently.

The patient started enteral feeding with good tolerance, TPN discontinued, and was discharged for home control within two weeks of the procedure. The CT control scan, one week later, was normal and showed no leaks. He began oral tolerance. He was scheduled to have the gastrostomy tube removed after the use of a sealing material (Histocryl) through an introducer in interventional radiology, before removing the gastrostomy, but a few days before the Foley tube fall out. Gastrointestinal transit was performed demonstrating complete sealing without leakage. The patient continued eating and the follow ups showed effective weight loss without problems in our dietary consultations and surgery.
Discussion

We have performed more than 1,000 bariatric surgeries since 1987. 214 were open VBG, 10 gastric bandings (GB), 350 Salmon’s technique, 222 open GBP, 60 LGBP, 140 revisional techniques surgery and since 2008 more than 120 LGS. With this background, we would like to comment on our experience.

Marceau et al [21] originally described the Parietal Gastrectomy in 1993 as a restrictive component of the biliopancreatic diversion with duodenal switch procedure [22]. Some years ago, some Duodenal Switch (DS) surgeons began doing the first part as a first stage in high risk patients in order to do the second stage later if it proved necessary, with increased safety [23-25]. The indications for GS have been increasing because patients had significant weight lost and did not require the second stage [4, 26, 27]. Furthermore, laparoscopic bariatric surgery is spreading rapidly due to the increasing prevalence of obesity. Obesity treatment requires a complex and systematic care. LGS currently represent 10% of bariatric operations in the world [1], although the authors consider it to be higher. Not until 2008, was the LGS added to the list of standard bariatric surgery procedures [26-28] and the staple-line leak is still of great concern and needs further investigation.

LGS has multiple advantages for bariatric surgeons: less complex laparoscopic procedure, no enteric anastomosis and no risk of internal hernia, dumping syndrome, or marginal ulcer. In addition, GS decreases the level of ghrelin hormone, has less malnutritional effects, allows for continued endoscopic access to the pancreaticobiliary system, and provides comparative weight loss and subsequent resolution of comorbidities that parallel gastric bypass surgery [29].

Himpens [30] presented long-term follow-up data for post LGS surgeries. The incidence of post-operative complications requiring reoperation was 5 %. Surprisingly, he used larger bougie (from 32-60 Fr). Another question not solved is the level of division in the antral area. There is risk of malfunction of the antral pumping mechanism if the dissection is too close to the pylorus.

Reinforcement of the suture-line, using different materials on the mechanical suture (synthetic material or bovine pericardium), organic adhesives or sutures, only prevent bleeding at the staples, but not leakage and it has been unable to reduce incidences [31,32,33]. It may be more effective to adapt cartridges size to the thickness of the wall as the sleeve is made. In most cases, starting with larger loads with staples (two applications) and then continues with smaller loads. Some additional procedures mentioned increase the overall cost of the operation and there is no definitive data on the benefit of these methods, although in the 2nd International Consensus Sleeve Gastrectomy [45], over 80% of specialists report using some of these methods.

The Spanish National Registry [2] has found significant differences in leaks (3.7 vs 8.8%) with the use of suture reinforcement. Our group does not agree with these findings, as we do not use reinforcements, although in some cases we have used haemostatic sealant. The use of blue methylene only indicates a technical failure at the time of the stapling, but it does not show the leakage secondary to ischemia or necrosis (48-72 h). Gagner [21] reported 3.66% and 4.6% of reoperations, with and without reinforcement, and other groups (2,24,31,34) reported 5.4 to 13.7% higher perioperative morbidity. 

Where is the fistula? The leaks occur mostly at two places on the gastric staple line; at a point opposite the incisura (20%), as in the case described here, where the stomach transitions from the horizontal antrum to the vertical fundus, and, in the most cases, close to the EGJ (80%).

Both these problems are likely related to technical issues. Surgical stapling is a compromise between tissue compression and tissue viability (ischemia-hemorrhage) [33]. The extent of stapler closure will depend on the thickest tissue incorporated into a staple cartridge. The antrum is thicker than the fundus and the fundus thicker than the esophagus; staple firings that incorporate these two areas in the same cartridge will have a propensity for inadequate closure on the thinner tissue and this may be a contributing factor for leaks [35].

Traditionally, authors have considered reoperation the best treatment for leaks. Nevertheless, nowadays, in many cases conservative treatment is the first management choice.

When a bariatric patient in the postoperative period presents tachycardia, abdominal pain or "murky drain", it is mandatory to carry out an abdominal CT scan with contrast and consider the possibility of a collection secondary to a leak that should be drained percutaneously. In many cases, conservative treatment is chosen [7] or, depending on the conditions of the
patient, a laparoscopy or laparotomy is performed for revision, although in many cases, it is not decisive and we are just able to drain the pool correctly.

Leaks primarily occur during the first seven PODs, called "early leaks", or after, called "late leaks". In the review carried out, almost 80% are "early leaks", primarily diagnosed by radiographic study of the upper digestive tract with contrast material soluble in water.

The rest of them, were also actually early leaks, but they were diagnosed late (after POD 7) [36]. These results highlight the role of CT scan in cases of sepsis, even many days after surgery. Just the suspicion of a leak is enough to use a CT scan. All fluid pools seen in a CT scan after a laparoscopic gastric sleeve should be considered a leak and demand aggressive treatment.

The review of the literature shows that most patients with leaks, who undergo a simple suture, required another procedure, due to persistence of the leak or failure of the suture [36]. In each patient, the operative procedure should ideally be: First, locate the leak using iconographic or endoscopic assistance by introducing a guide wire. The endoscopic assistance is advised due to the large volume of adipose tissue in obese patients, as well as inflammatory changes in the surrounding tissues with local peritonitis. Second is drainage. Then it may be sutured [8].

Once a leak is identified, the best solution involves tissue debridement proximal and distal to the fistula, suture closure in two layers and testing of the closure using methylene blue. If possible, omental buttressing to mimic a Graham type patch should be attempted, and drainage should be mandatory. An initial bougie size of 40 Fr or greater facilitates the ability to perform this repair without constriction of the resulting gastric lumen.

Decreasing the bougie size on the initial surgery may not affect weight loss, and may “burn the bridge” for this type of repair. Third, the jejunostomy procedure is advisable because of simple suturing that allows postoperative enteral nutrition. The indication of nutritional support is evident. An obese patient, may not have an excess body stores of protein, even in morbibly obese individuals. Fourth, even if the situation is favorable, a CT scan one week after the reoperation should always be carried out, in order to drain percutaneously any additional pools that are observed in a large number of patients.

If the leak persists two weeks later, many authors consider the placement of an endo-prosthesis; injection of glue (37) or 2-n-butyl cyanoacrylate possibly the most effective solution [38]. The endo-prosthesis needs to be evaluated prudently and possibly removed at the fourth week [39].

The practice of using esophageal endo-prosthesis to solve a proximal leak is due to the limited resources known for controlling the such leaks. The prostheses are designed to be used in the esophagus, and therefore easily migrate (30%) (37). Almost all authors have reported that the optimal removal time of the stent is approximately 6 to 8 weeks [38, 39, 40]. However, the optimal timing for the moving or removing of the endo-prosthesis should be considered at the forth week in order to avoid the appearance of gastric mucosal lesions or bronchial fistulas. The long stent required for the sleeve gastrectomy (at least 120 mm) is extremely irritating, and patients retch and gag to the point that adequate oral intake is difficult.

The long length of the stomach endo-prosthesis does not necessarily prevent to the fistula, and requires another to place within (through) to increase their combined length so as to exclude the fistula.

GS fistulas take some time (usually longer than six weeks) to heal. With the use of non-covered endo-prosthesis, there is a significant granulation tissue growth in them that makes removal difficult and often traumatic. Covered ones may alleviate this latter problem entirely, and have been used by gastroenterologists by temporarily placing them inside the fenestrated ones to compress the in-growth tissue and permit easier stent removal.

Therefore, the gastric reflux is constant and the success rate is anecdotal. However, the large number of LGS currently being done, will soon verify (or not) the evidence. Our group considers that the practice of using esophageal endo-prosthesis is a part of the overall treatment but not a universal solution.

A second line in the conservative approach to be considered is the improvement of gastric drainage. Following the surgical dictum, if there is no distal obstruction, the body will have a tendency to close the enteric fistula. This could, at least in theory, be accomplished by either Botox injection into the pylorus or even pyloric “through the scope” balloon dilatation or pylorus-plasty. There is, however, no valid data on this approach for fistula after sleeve gastrectomy. There will be major drainage but also more bile reflux.
Finally, after all these failed traditional attempts, Baltasar (6) has described an well-designed solution for bringing a jejunal Roux limb up to the fistula is to create an anastomosis. However, creating an enteric anastomosis in a contaminated environment can lead to dehiscence and may aggravate the initial problem. We consider this to be the last chance, when all other procedures have failed. Nevertheless, in some extreme cases the last recourse might be a total gastrectomy (18-19).

As noted initially, the best treatment for gastric fistula is prevention. The causes of fistula are multiple and synergistic. The following are basic guidelines to prevent them: 1. Do not reuse staplers. If you reuse one beyond its shelf life, it can misfire during the operation (30). 2. Avoid thermal injuries. It is better to apply haemostatic clips than electro-coagulation one on the staple line. 3. A gastric tube that is too narrow in the region of the incisura angularis of the stomach is a danger because of an increase in pressure in the fundus, the most vulnerable part above. Selecting patients carefully (BMI<50) and adopting the use of a 40-Fr or larger bougie may decrease the risk of leak (29). 4. Control the junction between staple cartridges. If it is necessary to sew over this junction, although we consider it unnecessary in most cases. 5. Caution in using an inadequate cartridge in a certain area. 6. It is correct to use Seamguard bioabsorbibles staple line reinforcement or fibrin glue as a seal, but only to prevent bleeding but suturing is more effective and helps train staff in suturing! [7].

In revision surgery (41), such as an adjustable gastric band transformed to a GS or a patient that has taken a gastric balloon temporarily, be aware of the hypertrophic gastric muscle generated in the reservoir. Use appropriate charges. 8. Always use a drain in GS, a methylene blue test does not invalidate leaks. 9. Convert to laparotomy when a reasonable doubt appears or difficult exposure. 10. Do not shoot the staple blindly, especially in the last shots. Always dissect the EGJ, leaving a centimeter of stomach. Take care of the redundant gastric bag. 11. The monitoring following the first 30 days is critical to avoid catastrophe (39).

Currently, our group is using 99mTc-DTPA introduced by the nasogastric tube at the end of the intervention and at 48 hours after the immediate postoperative period. A minimum elevation of the isotopic counts in the drainage fluid during the first 48 hours shows a technical problem and repeating oral dose at the third day will demonstrate an early leak. Our group is considering that this new evaluation is better than be a methylene blue test and esophagogastric transit. Further analysis is required to make a final assessment.

To finish, the authors want to highlight the recent incidence of LGS fistulas. Most researchers describe 0.7% to 3% of incidents (5, 10, 42), but the actual incidence may be as high as 5-9% in prospective studies (5). However, on the whole, a 2.7 % incident rate of fistulas is an accepted leak rate, taken from 24 studies covering over 1700 patients (43). Surprisingly, we find that the leak rate of the LVG is higher than in gastric bypass, generally acknowledged as having higher complication rates (37,44,45).

In recent literature, it appears that more conservative treatment of this complication carries better results than reoperations, and more importantly, no mortality (3,7). In this article, the revisional methodology includes 29 publications with a final pool of 4,888 sleeve gastrectomy patients. (40, 11, 14, 17, 13, 46).

To conclude, our group presents an algorithm of treatment of the fistulas after laparoscopic sleeve gastrectomy, based on the revision of the literature and our own experience (Fig. 4).
Fig. 4. Algorithm of treatment of LGS leaks

LPX (laparoscopic), RE-LPX (laparoscopic revision), Fr (French size of drain), TEGD (esophagus–gastro-digestive transit), EN (enteral nutrition), ENDOSC (endoscopy), RE-Q (reoperation), DREANAJE (drainage), MAL (bad result, patient unstable), NPT (parenteral nutrition), Q-URG (emergency surgery), 10 D (days), 3 W (weeks)

Conclusions

In the early postoperative period (within 24 hours), leaks are still best treated operatively. Laparoscopic exploration should be prompt in any patient who has tachycardia or respiratory difficulties that are not of pulmonary origin in the postoperative period, even in the absence of a demonstrable leak in an upper gastrointestinal contrast study. Even significant leaks may, paradoxically, be difficult to identify in the operating room.

Leaks that appear later in the postoperative course are probably best managed conservatively with escalating levels of invasiveness depending on the patient’s general state of health, local expertise and finally, the patient’s (and the surgeon’s) forbearance.

This is the first time, which interventional radiology takes part in treating a gastric distal fistula (antral) after LGS. The multidisciplinary treatment of a fistula is difficult and requires patience, but the fistula is the cause of death in most of the series, and any innovation in the management of these more difficult patients can be an option. In our case, the fistula was successfully solved at 4 weeks follow-up after placement of gastrostomy-guided and enteral nutrition. Not only do we propose a new method, but we present a new conservative non-surgical algorithm based on literary review in the management of fistulas.

References

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