



Endoscopic Internal Drainage Coupled to Prompt External Drainage Mobilization Is an Effective Approach for the Treatment of Complicated Cases of Sleeve Gastrectomy

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Abstract

Introduction Despite advances in treating gastric staple line leaks after bariatric surgical procedures, chronic leaks have been reported. Failure of their treatment frequently leads to radical surgery. We aimed to describe a strategy for preventing occurrence of chronic gastric leaks after complicated sleeve gastrectomy in patients necessitating relaparoscopy and external drainage as a first step of gastric leak management.

Methods Data from 14 consecutive patients admitted for gastric leak after laparoscopic sleeve gastrectomy were prospectively collected and retrospectively analyzed. Patients included underwent relaparoscopy and external drainage as first step of management.

Results Median time to gastric leak detection was 4 days. Emergency relaparoscopy allowed peritoneal lavage and external drainage placement next to the leak. Median time between surgery and endoscopic internal drainage (EID) was 4 days. Progressive external drainage mobilization started after 2 days. Control endoscopy was performed every 4 weeks until healing. A median interval of 112 days was necessary before healing in 13 patients. Thirteen patients (92.8%) had no gastric leak recurrence at 1 year. In one patient, EID was considerably delayed and external drainage mobilization prolonged, leading to chronic gastric leak and total gastrectomy after 18 months.

Conclusion This study reports for the first time a well-standardized protocol of early EID after relaparoscopy coupled to rapid external drainage removal for effectively treating complicated cases of sleeve gastrectomy. Bariatric surgeons should be aware of such therapeutic strategies and include them in their arsenal against postoperative gastric staple line leaks in severely obese patients.

Keywords Obesity · Bariatric surgery · Gastric leak · Fistula · Endoscopic drainage · External drainage · Sleeve gastrectomy

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Introduction

The number of overweight or obese patients worldwide has increased exponentially during the last two decades, reaching 61.1% of the population in the North-American continent, 54.8% in Europe, and 46% in the Eastern Mediterranean region according to the World Health Organization [1, 2]. Bariatric surgery, with its increasing number of procedures, is known to be the most efficient therapy for the treatment of morbid obesity [3]. According to the IFSO Worldwide Survey of 2016, the most performed primary surgical bariatric/metabolic procedure was sleeve gastrectomy ($N = 340,550$; 53.6%), followed by Roux-en-Y gastric bypass ($N = 191,326$; 30.1%) [4]. Despite their popularity, these two procedures are not devoid of complications. One of their most devastating complications is gastric staple line or anastomotic

leak, which often results in abdominal sepsis or even subphrenic abscess that may lead to pulmonary abscess and gastrobronchial fistula [5, 6].

Key steps in the management of leaks are broad-spectrum antibiotic therapy and prompt drainage of the extragastric collection, which can be performed by surgical, percutaneous, or endoscopic approaches [7]. Conventional surgical management consisting of relaparoscopy with peritoneal lavage and external drainage is indicated in case of unstable patients with diffuse peritonitis. However, this is associated with not negligible morbidity. Nevertheless, further complementary treatment may be required and endoscopy has been proved to be a very valuable tool in our arsenal [6–8]. It has been shown that techniques such as endoscopic placement of a covered stent or double-pigtail stent (DPS) or stricturotomy/internal drainage significantly accelerate healing of gastric staple line leaks, reducing morbidity and mortality of fragile obese patients [9, 10]. In addition, it has been recently shown that the use of an endoscopic internal drainage (EID) by a DPS is associated with shorter hospital stay, lower pain levels, and shorter treatment duration than when a covered stent is used [9, 11].

Despite advances in the treatment of gastric leaks after bariatric surgical procedures, chronic leaks and fistula have been reported in the current literature [12–15]. Chronic leaks and above all, fistula are more challenging to treat due to their persistence [16, 17]. Treatment failure of these chronic complications is often the case, frequently leading to radical surgery such as total gastrectomy or fistulo-jejunostomy to successfully address this issue once and for all. Thus, it is important to establish treatment protocols aiming to prevent the chronicization of leaks after complicated bariatric procedures.

Most of the patients presenting a gastric leak after laparoscopic sleeve gastrectomy (LSG) in our department are successfully treated by pure endoscopic internal drainage, nasojejunal feeding, and antibiotics, since leaks are contained and patients are hemodynamically stable with no signs of sepsis at the time of detection [18]. However, few of our patients presenting a non-contained gastric leak after LSG are hemodynamically unstable with signs of peritonitis and necessitate initial relaparoscopy with lavage/aspiration and external drainage placement. The aim of our study is to describe the strategy applied in our department for preventing the occurrence of chronic gastric fistula in this latter group of patients having had relaparoscopy and external drainage as a first step of gastric leak management. Our well-established protocol, consisting of early (within 7 days) complementary EID after relaparoscopy, coupled to rapid progressive external drainage mobilization, is thoroughly described and outcomes are reported and analyzed.

Methods

Data from all consecutive patients who were admitted in our department between January 2013 and January 2018 for gastric staple line leak after LSG were prospectively collected and retrospectively analyzed after institutional review board approval. A leak was suspected when computed tomography (CT) scan showed air within a perigastric fluid collection, with or without the presence of oral contrast leak. In our department, when the patient presenting gastric staple line leak is hemodynamically stable with no signs of sepsis despite infection or localized peritonitis, an EID coupled to antibiotic treatment is preferred. On the contrary, when the patient demonstrates hemodynamic instability, signs of sepsis, or diffuse peritonitis, relaparoscopy with surgical drainage is performed, followed by EID [19].

All patients included in this study underwent surgery as a first step of treatment, which consisted of laparoscopic lavage and external drainage of the leak. At the end, a total of 14 patients were included in our cohort: 13 of them having had initial bariatric surgery in our hospital (single-incision LSG) and one of them in another peripheral bariatric center (multiport LSG).

Treatment Protocol to Prevent Gastric Staple Line Leak Chronicization

All patients that underwent initial bariatric surgery in our department had the same treatment protocol to prevent chronicization of staple line leak, as follows (Fig. 1). After staple line leak detection on CT scan and surgical treatment consisting of laparoscopic lavage and external drainage (multitubular drainage; Coloplast, Rosny-sous-Bois, France) placed in proximity to the leak, all patients are placed in intensive care unit (ICU) under antibiotics therapy. Ideally, after 4 days of conservative management and antibiotic treatment in ICU and hemodynamic stability, patients are transferred to the Department of Endoscopy of Peupliers Private Hospital (Paris, France) for 24 h (before returning to the Surgical Department), in order to undergo therapeutic endoscopy and complementary drainage of the leak by DPS (G Flex, Brussels, Belgium) while a nasojejunal tube (Corflo-Corpak® MedSystems, IL, USA) is simultaneously placed for enteral feeding. The diameter of DPS used is 7 and 10 French to pass through a standard frontal view upper or lower and/or side view scope, while their length is 3 or 5 cm. When patients return to the Surgical Department and 2 days after EID of the leak, rapid mobilization of the surgically placed external drainage is initiated, regardless drainage production. The external drainage is subsequently mobilized every day, 2 cm per day until its output drops off, and finally removed. This attitude allows to avoid persistent suboptimal pressure gradient between DPS and the external drainage, which is

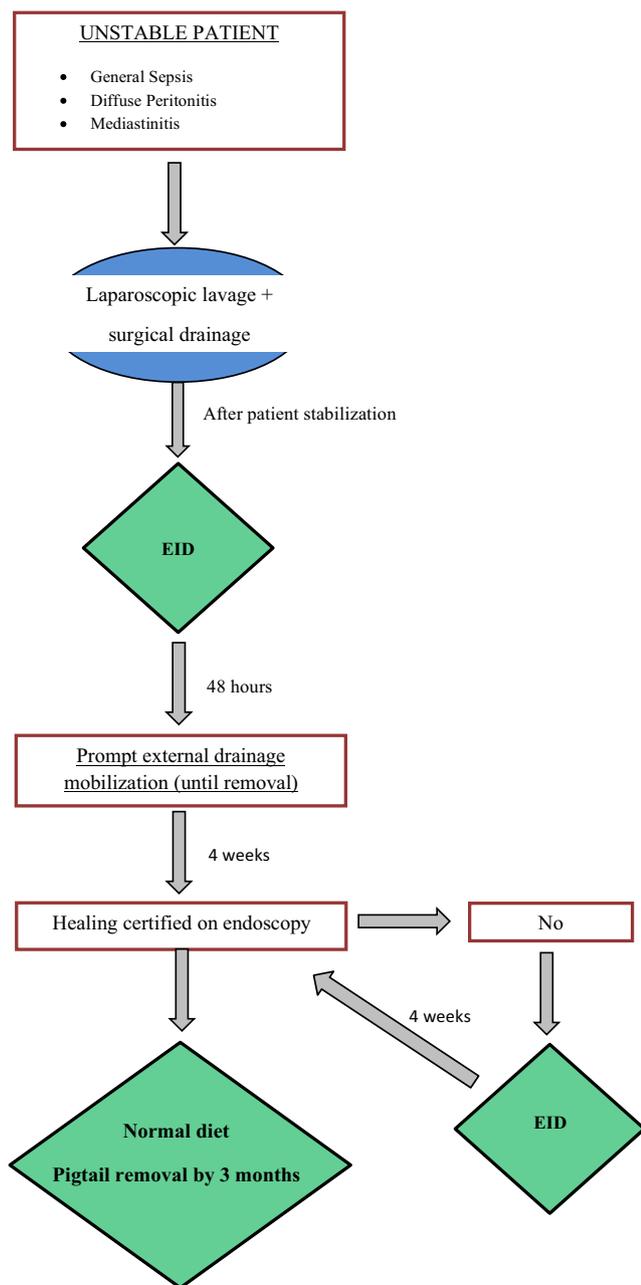


Fig. 1 Treatment algorithm for unstable patients after LSG. EID, endoscopic internal drainage

the basis of leak chronicization. Finally, the external drainage is further mobilized until it is completely removed. Thorough patient’s surveillance regarding tolerance and correct application of enteral feeding is performed in our Surgical Unit before discharge is allowed at home. Continuous and exclusive enteral feeding through the nasojejunal tube is applied until healing. It should be noted here that this protocol is adapted to the patient’s medical condition and if a septic complication occurs during external drainage mobilization, mobilization is stopped as well as nasojejunal enteral feeding and a control abdominal CT scan performed; external drainage mobilization

and nasojejunal enteral feeding are resumed if the abdominal CT scan shows a contained leak and if the patient is hemodynamically stable.

One patient did not undergo initial LSG in our department but was addressed to us after relaparoscopy and external drainage of a gastric staple line leak. This patient received a similar protocol as the above-mentioned one, consisting of rapid endoscopic drainage of the leak by DPS, and nasojejunal tube placement, mobilization of the external drainage which was progressively mobilized until removal, and discharge with continuous and exclusive enteral nutrition through the nasojejunal tube.

Follow-up

Follow-up of these patients was made in association with the endoscopists of Peupliers Private Hospital. All patients underwent a first endoscopic control at 28 days. Upper endoscopy was performed under general anesthesia and orotracheal intubation. After exploration, a dynamic upper swallow study contrast through the endoscopic working port allowed to confirm the absence of free medium contrast extravasation (healing). Despite the regression of the gastric leak cavity, smaller pigtailed were left in place to promote maximal granulation and complete disappearance of the existing pseudocavity, while at the same time normal diet was started. Patients were discharged 3 days later. A final endoscopy was performed in the following 3 months to withdraw all DPS still in place.

If instead, at first endoscopic control, extravasation of medium contrast was noted, additional DPS were inserted to optimize drainage and exclusive nasojejunal tube feeding was applied for four more weeks before complementary endoscopic control. Additional endoscopic controls were performed until complete healing.

Data Collection and Statistical Analysis

Data were prospectively gathered in an electronic database and retrospectively analyzed. Data of interest were patients’ characteristics, peri-operative course, endoscopic findings, and follow-up details. Surgery-related mortality was considered to be death of any cause occurring within the first 30 postoperative days. Staple line leakage was regarded as a complication when an intra-abdominal abscess, requiring drainage or antibiotic treatment, was found on CT scan or during relaparoscopy.

The statistical program Prism version 5.0 (GraphPad Software, La Jolla, CA) was used for processing. Quantitative variables are expressed as median (range) as appropriate, while qualitative variables are expressed as frequencies (percentages).

Results

From April 2013 to December 2017, 14 patients (13 women/1 man; median age, 38 years) undergoing LSG were treated for gastric staple line leak using the above-described protocol. Median weight and body mass index (BMI) at the time of LSG were 106 kg (range, 88–143) and 40.4 kg/m² (range, 34.9–44.2), respectively. Five patients (35.7%) had another bariatric surgery prior to LSG: 3 had adjustable gastric banding and 2 vertical banded gastroplasty. Median weight and BMI at the time of relaparoscopy for gastric staple line leak were 102.7 kg (range, 84–137 kg) and 38.4 kg/m² (range, 32.5–42.5 kg/m²), respectively (Table 1).

Median time to gastric staple line leak detection was 4 days after initial bariatric surgery (Table 2). Clinical presentation of the leak varied among patients: 2 patients (14.2%) presented with fever, while 12 (85.8%) arrived with signs of septic shock. Emergency abdominal CT scan revealed the presence of uncontained leak with localized or diffuse peritonitis. Leak location for all patients was at the proximal segment of the stomach, just below the gastro-oesophageal junction and none was associated with a stricture at the incisura. After diagnosis, emergency relaparoscopy allowed peritoneal lavage and external drainage in vicinity to the leak. Median time between surgery and endoscopic treatment was 4 days. All patients had EID of the leak by DPS and nasojejunal enteral feeding tube placement (Video 1). In three patients, a gastric tube stenosis was noted at medium level of the remaining stomach and in addition to EID, a short fully covered lumen-apposed metal stent (FCLAMS) (NAGI® Stent, Taewoong Medical, Busan, South Korea) was delivered for calibration, which was removed 4 weeks later (Fig. 2). Progressive mobilization of the external drainage was initiated after 2 days, regardless drainage production, until removal. Control endoscopy was systematically performed every 4 weeks until healing. Median number of control endoscopic sessions was 4 (range, 1–8), with 3 patients (21.4%) healing rapidly and having their DPS removed after only one endoscopic session and 11 patients (78.6%) necessitating further control endoscopies. A median interval of 112 days after initial EID was necessary before healing in 13 patients. When healing was documented

on endoscopy, normal diet was resumed, nasojejunal enteral feeding tube was removed and DPS retrieval was performed in the following 3 months. Patients' condition during the treatment protocol was generally good, with no undernutrition or any complications in relation to exclusive nasojejunal enteral feeding.

Thirteen patients (92.8%) completed the 1-year follow-up with no gastric leak recurrence. Our therapeutic attitude failed in one case (7.2%). This was a 39-year-old female patient (BMI = 40.4 kg/m²) with a gastric staple line leak found on postoperative day 2 and who underwent relaparoscopy 3 days later. The late transfer of the patient to our department resulted in a delayed first endoscopic control with DPS placement which took place 17 days after relaparoscopy, while external drainage mobilization was prolonged and lasted for a total of 25 days after EID. Consequently, the laparoscopic external drainage was left in place for a total of 42 days. Despite 8 sessions of endoscopic treatment, the persistence of the gastric staple line leak led to definitive treatment by total gastrectomy 18 months after initial bariatric surgery.

Discussion

Gastric staple line leaks after bariatric surgery can have different clinical manifestations and various treatment options exist at their occurrence, ranging from immediate surgical revision by laparoscopy or laparotomy to simple conservative treatment [19–23]. The treatment modality depends on the timing of fistula appearance and on the severity of symptoms associated with the presence of the leak [22–24]. Until recently, surgery was the treatment of choice for gastric staple line leaks after bariatric procedures. During the last years, the development of endoscopic techniques has played a crucial role in the minimally invasive management of gastric leaks. The efficacy of these techniques allows management of some patients by pure EID, broad-spectrum antibiotics, and enteral feeding [25]. However, for a significant percentage of patients showing signs of peritonitis, relaparoscopy coupled to endoscopic treatment is preferred [19]. These patients are more exposed to the risk of chronic fistula formation, with numerous cases of chronic fistulas, especially gastrobronchial fistulas, reported in the literature that required radical surgery such as total gastrectomy or fistulo-jejunostomy [5, 26, 27]. Considering that gastric leaks tend to become persistent and potentially progress in chronic fistulas in cases of inadequate treatment, developing prevention approaches has become a major concern in the medical community. It should be also noticed that post-sleeve fistulas are usually the most difficult to heal in comparison with those after Roux-en-Y gastric bypass probably due to the high pressure within the stomach after sleeve gastrectomy [27, 28]. Our strategy of early EID after relaparoscopy coupled to rapid external drainage removal has been proven

Table 1 Characteristics of patients (*n* = 14)

Age (years), median [range]	38 [28–69]
Gender (female/male), <i>n</i>	13/1
Weight at initial surgery (kg), median [range]	106 [88–143]
BMI at initial surgery (kg/m ²), median [range]	40.4 [34.9–44.2]
Previous obesity surgery, <i>n</i> [%]	5 [35.7]
Weight at LD (kg), median [range]	102.7 [84–137]
BMI at LD (kg/m ²), median [range]	38.4 [32.5–42.5]

BMI, body mass index; LD, leak detection

Table 2 Timeline of gastric leak management

Time to LD (days), median [range]	4 [0–15]
Time between LD and ST (days), median [range]	0 [0–3]
Time between ST and EID (days), median [range]	4 [0–17]
Time between EID and first mobilization of external drainage (days), median [range]	2 [2–4]
Time between first EID and healing (days), median [range]	112 [28–224]*

LD, leak detection; ST, surgical treatment; EID, endoscopic internal drainage

*Data for the 13 patients that healed

successful for the management of complex gastric staple line leaks after LSG, avoiding fistula chronicization. It should be however mentioned that in this series, all patients being treated with the above-described protocol had early postoperative non-contained leaks leading frequently to sepsis and necessitating relaparoscopy, since in our department, the majority of patients with contained leaks are treated by pure endoscopic treatment, antibiotics, and exclusive nasojejunal feeding [18].

The treatment of bariatric surgery complications associates frequently surgical and endoscopic treatments. However, despite these treatments chronic fistulas may occur. Recently, we have standardized a protocol of pure endoscopic treatment for the management of gastric staple line leaks in hemodynamically stable patients [25]. In these patients, this attitude favors drainage flow into the gastric tube as the result of three different variables: (i) intra-gastric pressure (negative pressure due to peristaltism); (ii) external pressure (drainage pressure); (iii) intra-abdominal pressure (positive pressure), which leads to preferential drainage inside the gastrointestinal tract [29]. Similarly, EID does not work in the thorax because the negative pressure is outside and not in the esophageal lumen. However, for a significant percentage of patients, especially those being hemodynamically unstable and having symptoms

of peritonitis, surgical lavage of the abdominal cavity with external drainage placement prior to EID is mandatory. In presence of external and internal drainages in the same extragastric cavity, a suboptimal pressure gradient between DPS and external drainage persists leading to sustainability of the fistula tract which is the origin of the creation of an internal-external communication. Numerous bariatric surgeons begin external drainage mobilization when this is not productive, aiming mainly to avoid the formation of intra-abdominal collections. However, in the case of an internal-external communication created by drainages, rapid mobilization of the external drainage is mandatory to avoid an organized tract and chronicization of the fistula. In our series, the only patient who suffered a chronic fistula necessitating a total gastrectomy 18 months after initial bariatric surgery was a patient that had EID 17 days after relaparoscopy and external drainage placement. In this patient, delayed endoscopic treatment and prolonged external drainage mobilization led to the creation of a persistent internal-external communication which was the cause of leak chronicization and was unable to heal despite successive endoscopic treatments.

Indeed, a gastric leak should be considered chronic after 12 weeks and surgical management is then warranted [30].

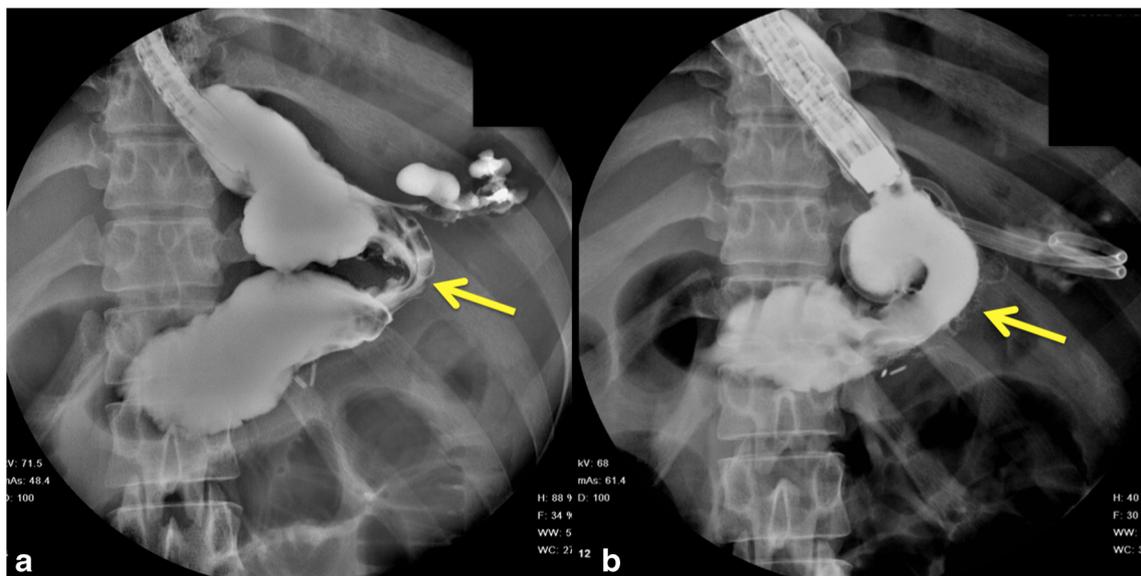


Fig. 2 Placement of two double pigtailed allowing drainage of a perigastric collection coupled to fully covered lumen-apposed metal stent (yellow arrow) treating associated sleeve stenosis

Patients with persistent fistulas are candidates for salvage surgery, including conversion to gastric bypass or total gastrectomy [31, 32]. The placement of a Roux limb on the site of the fistula or above aims at transforming a high-pressure system, constituted by the sleeve construction, into a low-pressure system. A low-pressure system reportedly facilitates fistula healing in foregut surgery [28, 33]. However, this technique is limited by technical difficulty and the fragility of the anastomosis on inflammatory tissues which carries an important risk for a leak. On the other hand, total gastrectomy is associated with a relatively high risk of complications related to the esophagojejunal anastomosis and to frequently cumbersome nutritional consequences [26].

Currently, in our department, we favor EID for the postoperative treatment of complicated bariatric patients and avoid the use of fully covered self-expandable metal stents (FCSEMS). Since the 1990s, fully covered self-expandable metal stents (FCSEMS) had been used to bypass the gastric leak defect, thus allowing early oral intake [34]. Before stent deployment, it is mandatory to drain any abdominal collection (surgically or radiologically). An abscess cannot be treated by isolating it and it would be hazardous to deliver a FCSEMS for the treatment of a leak if an infected collection is present. Unfortunately, several adverse events have been reported with the use of FCSEMS [35]. The most frequent is stent migration, which is very common if no concomitant stricture is present. Refilling of the leak has also been reported. This may occur because FCSEMS does not guarantee a watertight sealing. Tissue ingrowth with stent occlusion at the distal edge and gastrointestinal perforation may occur as well after stent deployment, and even some ancillary cases of aorta rupture leaving to death have also been reported [36]. In our experience, such complications are even increased by using newly designed “mega-stents.” Being larger and longer, they may induce local ischemia due to higher radial force and facilitate tissue ingrowth due to their firm fixation.

To our knowledge, there are no data in the current literature regarding EID and external drainage mobilization in complicated cases of bariatric surgery. It is our belief that EID must be applied in cases of externally drained gastric leaks to achieve healing and avoid subsequent heavy surgical management. This study reports for the first time a well-standardized protocol of prompt EID after relaparoscopy coupled to rapid and progressive external drainage mobilization for successfully addressing the issue of complicated gastric staple line leaks and avoid fistula sustainability. However, this study has several limitations that should be underlined. First, despite the use of a prospective electronic database, our analysis is exposed to inherent classical bias due to its retrospective nature. Second, bias is also accentuated by the fact that one patient had initial bariatric surgery and delayed gastric leak management outside our center. Finally, the total number of patients is small and these results should be confirmed by a larger cohort.

Conclusion

The results of this preliminary study strongly support the necessity for an early endoscopic drainage in selected patients having had relaparoscopy and external drainage as a first step of gastric leak management after LSG, coupled to subsequent rapid external drainage mobilization and removal to effectively treat complicated cases of sleeve gastrectomy. Considering the devastating long-term effects of chronic gastric fistulas, bariatric surgeons should be aware of therapeutic strategies as the one described in this study and include them in their arsenal against postoperative morbidity and mortality of severely obese patients.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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