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Endoscopic Vacuum Therapy for Anastomotic Leakage After Distal Gastrectomy in a Renal Transplant Patient: A Case Study

Authors' Contribution:
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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Male, 66-year-old
Final Diagnosis: Anastomotic dehiscence • gastric adenocarcinoma
Symptoms: Anemia
Clinical Procedure: —
Specialty: Surgery

Objective: Unusual clinical course

Background: Since the late 2000's, endoscopic vacuum therapy (EVT) has gained popularity in the management of anastomotic leakage (AL) of the upper gastrointestinal (GI) tract due to its safety and efficacy. This report describes a 66-year-old male renal transplant patient with an AL following distal gastrectomy for gastric adenocarcinoma and was treated with EVT.

Case Report: We present the case of a 66-year-old transplant patient with multiple comorbidities who developed AL following distal gastrectomy for gastric adenocarcinoma. Before the scheduled operation, he had been deemed at high risk for AL due to immunosuppression, as well as his history of end-stage renal disease and multiple abdominal surgeries. After an initial failed attempt to treat the AL surgically, he became the first person to be treated with a self-assembled EVT in our hospital. He was successfully treated with EVT and was ultimately safely discharged. Also, 30 days after discharge, he did not report any discomfort or express any problems with oral intake of food, as supported by the findings of a follow-up endoscopy.

Conclusions: EVT is a reproducible technique, which when performed by experienced practitioners, remains effective even in the absence of prior experience with the procedure or even procedure-specific equipment. The technique shows promising outcomes in the management of AL and this case highlights the technique's effectiveness even in a patient with compromised wound healing in the presence of a hostile abdomen.

Keywords: Anastomotic Leak • Gastrectomy • Kidney Transplantation • Endoscopic Vacuum Therapy • Case Report

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/946626

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Introduction

Anastomotic leakage (AL) following upper gastrointestinal (GI) surgery can have a significant impact on the surgical outcomes due to its association with increased morbidity and mortality [1]. Well-known causes of AL are technical aspects such as poor blood circulation, excessive tension at the anastomosis, high intraluminal pressure due to stricture or obstruction, or suturing and stapling failure [2]. Furthermore, medications such as corticosteroids and immunosuppressive agents are implicated in wound healing, jeopardizing a well-constructed anastomosis and resulting in AL [3,4]. Finally, comorbidities such as obesity, cardiovascular disease, anemia, diabetes, and renal failure can also have a remarkable impact on the anastomotic site [5]. The above risk factors are involved in any type of gastrectomy and esophagectomy.

Various treatment alternatives are available; however, each patient is different, so treatment requires a tailor-made approach. The current guidelines for the management of postoperative anastomotic leaks in the upper GI depend on the patient's condition and vital signs [2]. If the vital signs are stable, conservative treatment (antibiotics, total parenteral nutrition, and octreotide) and percutaneous drainage of any focal abscesses are advised. If no improvement is seen, then endoscopic treatment, either by clipping, EVT, or self-expandable metal stent (SEMS) should be considered. However, if during conservative treatment, the patient develops signs of diffuse peritonitis, then surgical treatment is warranted. Surgical treatment is advised also if the patient's vital signs are unstable or if the endoscopic treatment fails. It can include primary repair of the defect, additional resection, and insertion of multiple drains or a feeding jejunostomy, and is subject to the surgeon's discretion. Among endoscopic treatment options, EVT stands out as a contemporary and acknowledged approach for effectively addressing AL in both the upper and lower GI tract [6]. Based on recently published guidelines from the European Society of Gastrointestinal Endoscopy (ESGE), EVT is an option for esophageal and gastric perforations, although more evidence is required [7]. Furthermore, recent systematic meta-analyses show that EVT is associated with significantly higher healing rate, shorter treatment duration, and lower rates of major complications [8,9].

The aim of this case study is to present the case of a transplant patient who experienced AL after distal gastrectomy and was successfully treated with a self-assembled EVT. Against this background, similar cases are presented.

Case Report

The case study was developed according to the Case Report (CARE) guidelines [10]. Similar studies that investigated the use of EVT for treating AL after esophagectomy or gastrectomy are included and presented in the discussion to enrich the background.

A 66-year-old man was admitted for a scheduled distal gastrectomy to treat a previously diagnosed gastric adenocarcinoma. He had undergone an upper-GI endoscopy to investigate anemia, and a small-sized tumor located at the antrum, proximal to the pylorus, was revealed. Biopsies were taken and the histological examination was consistent with gastric adenocarcinoma, which was classified as poorly cohesive with signet-ring cells. A computed tomography (CT) scan was performed for staging of the tumor and showed only mild abnormal thickening of the stomach wall. The positron emission tomography scan revealed no distant disease, and based on the preoperative staging and the clinical TNM (cTNM), the tumor was classified as stage I (T1b, N0, M0). The patient did not receive any neoadjuvant chemotherapy, and we decided to perform upfront surgical treatment.

His previous medical history included a living-donor kidney transplant at the age of 49 due to end-stage renal disease, and he had received CAPD (continuous abdominal peritoneal dialysis) for 4 years prior to the renal transplantation. After the transplantation, he received immunosuppression treatment with 50 mg cyclosporine twice daily, 500 mg mycophenolate mofetil twice daily, and 4 mg methylprednisolone twice daily. His renal function was satisfactory, with a baseline level of creatinine and urea at 1.2 mg/dl and 65 mg/dl, respectively, with approximately 2 L of daily urine output. He also had an aortic metallic valve replacement and a coronary artery bypass surgery graft (CABG), receiving a vitamin K antagonist, clopidogrel, and anti-hypertensive medications daily. Finally, he had undergone an umbilical hernia repair and an extensive small-intestine resection because of an intra-abdominal abscess that resulted in a small intestine length of 220 cm. Due to the comorbidities and the hostile abdomen, the patient was initially considered as high-risk for AL. Prior to the scheduled surgery, a bridging protocol was applied with classic IV heparin and target aPTT of 60-70 seconds due to the aortic metallic valve replacement.

During the scheduled distal gastrectomy, after entering the peritoneal cavity, dense adhesions and evidence of sclerosing peritonitis due to the history of CAPD were found. A laborious distal gastrectomy was performed with a Billroth II reconstruction, along with a cholecystectomy. A stapled retro-gastric anastomosis was performed, the defect was closed with interrupted sutures, and a Jackson-Pratt (JP) drain was placed by the anastomosis. A nasogastric tube was placed intraoperatively, and the patient was awakened without any complications.

On the 5th postoperative day (POD), the drain output increased with a significant air leak, mixed with a small amount of bile,

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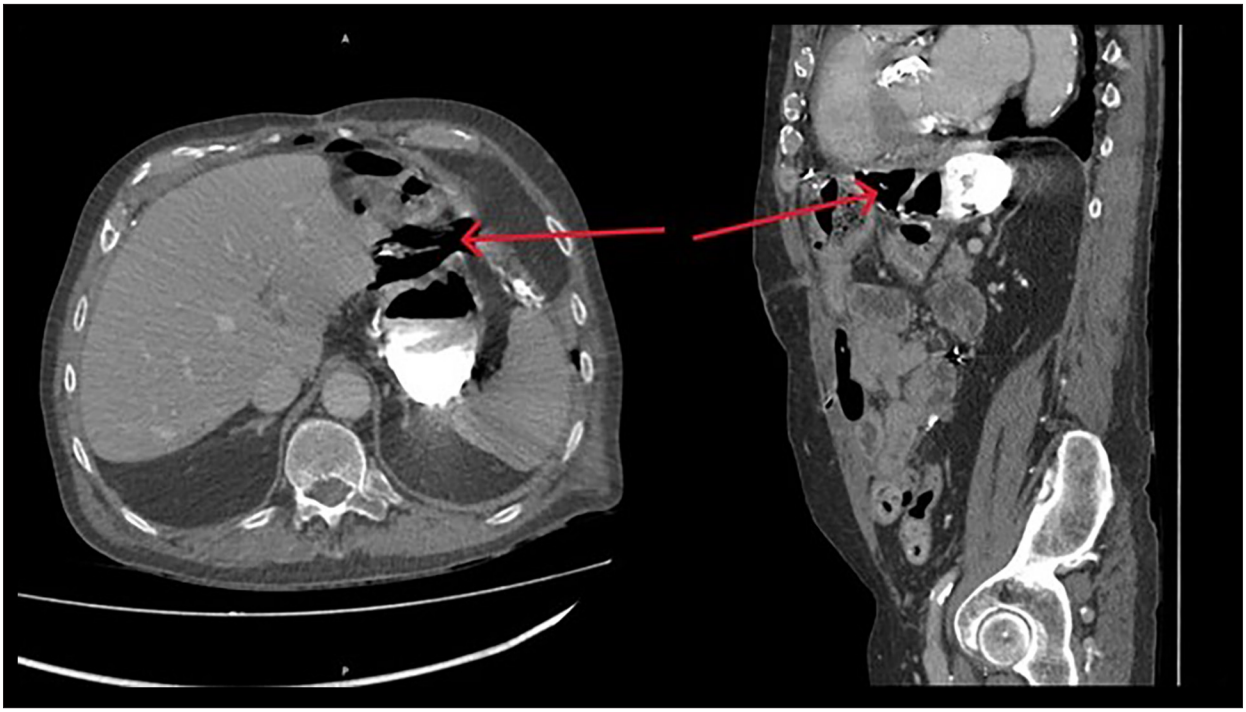

Figure 1. Axial and sagittal view of computed tomography scan depicting the stomach pouch filled with oral contrast at the level of the anastomosis. Red arrow points the extraluminal air around the drain tube. No oral contrast leakage can be seen.

and his vital signs started to deteriorate. An urgent CT scan was performed, with images taken before and after oral contrast medium. The series revealed a small amount of air near the drain tube (red arrow in **Figure 1**), although the oral contrast was not visible outside the GI tract at the time of the imaging study (**Figure 1**). He was taken to the OR for an emergency exploratory laparotomy, where a defect was identified along the suture line of the anastomosis, with ischemia being the most probable case, which was later confirmed by the histopathology results of the specimen. The duodenal stump was examined and was found intact. A revision of the gastro-jejunal anastomosis with Roux-en-Y reconstruction with a circular stapler was performed and 2 JP drains were inserted, one (right) near the duodenal stump and the other (left) near the gastro-jejunal anastomosis. On the 6th POD (11th POD since the first scheduled operation) the left drain output changed, and the tested fluid was positive for amylase without any deterioration in vital signs. Initially, the emergency CT that was performed did not reveal a leak. On the 9th POD, a fluoroscopy exam with oral contrast was performed, which revealed a small leak from the gastric pouch at the left side of the anastomosis (red arrow demonstrates the leak in **Figure 2**).

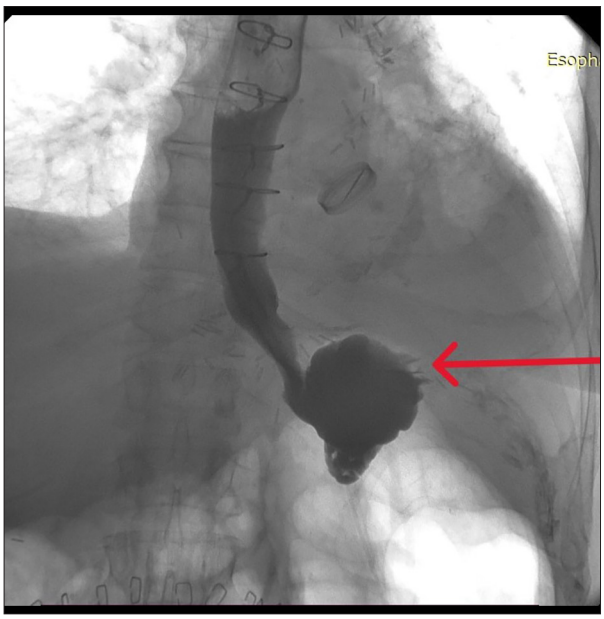

Figure 2. Fluoroscopy upper-gastrointestinal series with oral contrast, revealing leakage of contrast to the left (red arrow).

Since the patient was stable and the fluid was adequately drained, a multidisciplinary meeting was conducted. It was decided that due to the patient's history and the finding of the surgeries, a redo surgery could not guarantee that a leak would not reoccur, so the next day an endoscopy was performed, which revealed a 3-cm defect just above the gastro-jejunal anastomosis. Since the defect was larger than 2 cm, over-the-scope clips were not applied. Additionally, the location of the perforation raised concerns about the effectiveness of a stent. Ultimately, after another multidisciplinary meeting,

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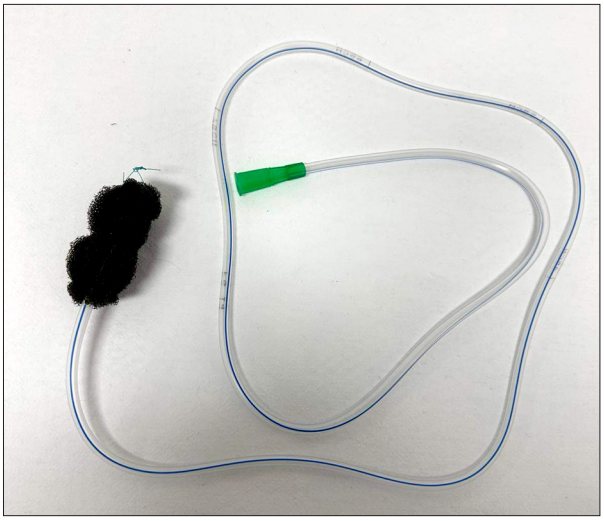

Figure 3. Self-assembled endo-vacuum device. A polyurethane sponge was sutured at the tip of a 14Fr nasogastric tube, which was placed intra-luminally, sealing the defect of the anastomotic leakage.

the team decided to proceed with endoluminal sponge placement and initiate EVT. This was the first time that this procedure would be attempted in our institution. An informed consent was signed by the patient after a thorough discussion.

A commercial Endo VAC system was not available, so a self-assembled version of an endoluminal sponge connected to an NG tube was used. The procedure was performed under conscious sedation with midazolam. A nasogastric tube (14 Fr) was introduced through the nose and orally exteriorized. The distal end of the nasogastric tube was covered with a polyurethane sponge and fixed with a PDS 3-0 suture. The sponge was trimmed to the specific wound size as estimated by the endoscopist (**Figure 3**). The sponge was then grasped with endoscopic biopsy forceps, introduced, and advanced into the stomach with the help of a standard endoscope. After confirming appropriate placement, the NG tube was connected to an electronic vacuum pump designed for negative-pressure wound therapy, with alarm function (Simex300, Simex Medizintechnik GmbH) and continuous suction (-80 mmHg) was applied.

After the first placement, the patient's clinical condition started to improve, along with the laboratory test results, and reduction in the drain output was confirmed. Five days after the placement of the EVT system the first sponge change took place. Before removing the sponge, the suction was discontinued. The nasogastric tube was grasped endoscopically close to the distal end and was uneventfully removed. With each sponge change, the defect was endoscopically assessed. The sponge was changed 3 times following the same procedure; however, the size of the sponge remained the same (replacement intervals 4-6 days). Granulation and a gradual decrease in size of the defect were observed after every sponge replacement, as depicted in **Figure 4**.

The sponge was finally removed after 24 days of treatment. Two days after removal of the EVT system, the patient was in good condition and a contrast swallow examination did not reveal any leaks. During the treatment, the patient received total parental nutrition as well as hemodynamic support with inotropes, beta-blockers and oxygen therapy. In addition, immunosuppression treatment with tacrolimus and methylprednisone was also gradually introduced from the second POD after the first scheduled surgery and continued throughout the patient's hospital stay. After the sponge removal, oral feeding was initiated gradually and was well tolerated. The patient was safely discharged 10 days later. The results of the histology revealed a poorly cohesive gastric adenocarcinoma, located at the antrum, with negative lymph nodes and clear proximal and distal margins, staged as T1bN0M0. Another follow-up endoscopy of the asymptomatic patient 30 days after discharge revealed a normal postoperative condition, with a fully closed defect.

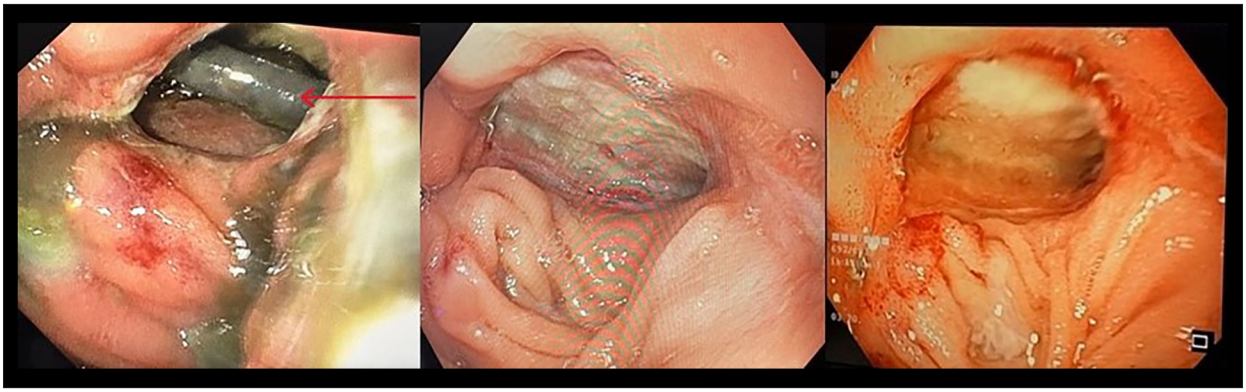

Figure 4. Endoscopic images showing the initial size of the defect at the level of the anastomosis with a visible drain (red arrow), showing results after the first sponge replacement and the final closure of the defect with formation of granulated tissue.

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Table 1. Studies investigating the use of EVT in upper-gastrointestinal surgery.

Author	Year	No. patients	Procedure (No.)	Endoscopic vacuum therapy			
				No. sponge replacement	Clinical success (%)	Confirmation of technical success	Complications (No.)
Wedemeyer et al [11]	2008	2	TTE (1) THE (1)	5	(100)	Endoscopy Contrast study	...
Weidenhagen et al [12]	2010	5	TTE (5)	5-14	(100)	Endoscopy	Stricture (1)
Loske et al [13]	2011	8	TTE (1) Gastrectomy (7)	1-10	(100)	Endoscopy	Stricture (1)
Schniewind et al [14]	2013	17	TTE (17)	...	(71)	Endoscopy	Death (2) No resolution (3)
Schorsch et al [15]	2014	21	TTE (7) THE (5) Gastrectomy (9)	...	(95)	Endoscopy	...
Mennigen et al [16]	2015	22	TTE THE	1-18	(86)	Endoscopy Contrast study	Death (3)
Laukoetter et al [17]	2017	39	Esophagectomy (30) Gastrectomy (9)	1-25	(94)	Endoscopy Contrast study	Stricture (4) Death (2) Bleeding (2/2)
Bludau et al [18]	2018	59	TTE (36) Gastrectomy (15) Other (8)	1-9	(78)	Endoscopy	Death (9) Bleeding (2/9)
Berlth et al [19]	2019	34	TTE (25) Gastrectomy (9)	1-9	(86)	Endoscopy	Stricture (1)
Zhang et al [20]	2021	55	TTE (55)	1-14	(89)	Endoscopy	Bleeding (1) Death (4)
Reimer et al [21]	2022	102	Esophagectomy (71) Gastrectomy (22) Other (19)	2-8	(80)	Endoscopy	Sepsis stricture
Chon et al [22]	2023	20	RAMIE (20)	1-6	(75)	Endoscopy	...
Maier et al [23]	2023	17	TTE (14) THE (3)	2-12	(71)	Endoscopy	Stricture (7)

TTE – transthoracic esophagectomy; THE – trans-hiatal esophagectomy; RAMIE – robotic assisted minimally invasive esophagectomy.

Discussion

This case report describes the efficacy of EVT for treating AL after gastrectomy in a high-risk patient. EVT can be considered as an alternative endoscopic option for treating perforation of the upper GI tract. After searching the literature, similar studies that investigated the role of EVT for treating AL are presented in **Table 1** [11-23] and discussed in relation to our patient. EVT first appeared in 2008 and has gained remarkable popularity in the last 5 years. Regarding the type of procedure, unsurprisingly, EVT is applied mostly in esophagectomies, either transthoracic (TTE) or trans-hiatal (THE), while there are fewer cases involving distal and total gastrectomies. Esophagectomy has an increased rate of AL compared to gastrectomy (more than 20% and 10%, respectively) [24] and the reoperation is more demanding, with technical difficulties [25,26] and is associated with increased mortality [27,28], necessitating implementation of less invasive endoscopic techniques such as EVT.

The technical details of EVT are interesting. EVT requires a series of endoscopies to replace the sponge and evaluate the size of the defect. Reviewing the studies presented in **Table 1** shows a wide range in the number of sponge replacements, since not only the size of the defect varies but also each patient has a different wound healing ability. However, regardless of

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the number of endoscopies, the clinical success is quite promising, at over 70% in all the presented studies.

For assessing technical success, endoscopy is the best tool available to the surgeon, since it can reliably evaluate defect closure and proliferation of the granulated tissue. Oral contrast was used in 3 studies for evaluating the closure of the defect, but it is a more subjective exam and is not as sensitive as endoscopy.

Delving deeper into the pathophysiologic changes, the healing effect of EVT is based on negative-pressure wound therapy. There are multiple mechanisms involved, such as changes in perfusion and bacterial control with the continuous aspiration of secretions, pus, and necrotic debris. All of these stimulate the formation of vital granulated tissue, providing a healthier local environment and ultimately facilitating secondary wound healing [29,30]. Although our patient had severe comorbidities affecting wound healing, granulation tissue was immediately observed after the second sponge replacement, further confirming the positive impact of EVT in wound healing. When the EVT was removed, the defect was fully closed with granulation tissue, suggesting technical success. This was confirmed with an endoscopy, which was also in line with the definition of success in the studies presented in **Table 1**.

Several factors might influence the effectiveness of EVT in treating AL, such as timing of the intervention, size and location of the defect, presence of comorbidities, adequacy of drainage, and the nutritional support [21,30]. Apart from the comorbidities and the medications of our patient that severely affected wound healing, the sclerosing peritonitis further jeopardized the anastomosis while creating a hostile abdomen. All these factors contributed to disruption of the anastomosis and resulted in AL, creating a 3-cm defect during the endoscopy. Reimer et al suggested defect sizes >3 cm are associated with prolonged EVT and more septic complications when compared with smaller defects [21]. Although our patient's defect was about 3 cm, he was supported with parenteral nutrition and antibiotics, managing to avoid any septic complications.

In many specialized centers, EVT has become the standard of care for AL, and it can be a preemptive measure for reducing the rate of AL in high-risk patients. Despite the preliminary data presented by Adamenko et al, the multicenter randomized controlled trial pre-SPONGE will shed more light regarding the prophylactic use of EVT for high-risk patients who undergo minimally invasive TTE [32,33]. Considering the high-risk features of our patient, this could protect the anastomosis, reducing the possibility of AL.

Apart from the benefits and the high clinical success of EVT, clinicians should be familiar with the potential complications. These are mainly minor complications such as sponge dislodgement, sponge rupture during placement, and local bleeding after removal [6]. Heits et al reported that the most common adverse effect of EVT with the highest impact on a patient's quality of life is stricture of the anastomosis [34], and **Table 1** shows the incidence of stricture of the anastomosis. Another complication that can lead to death is severe bleeding. This is mainly associated with the erosion of the thoracic aorta due to the negative pressure during EVT, resulting in massive hematemesis and immediate death [35] (**Table 1**) Hemodynamic instability due to bleeding during EVT should always be included in the differential diagnoses when the patient's vital signs deteriorate.

This is the first case of EVT for the upper GI tract performed in our institution, and its rarity is a major limitation of this case report since it lacks standardization and experience. However, to the best of our knowledge, this is the first time that EVT was used in an immunosuppressed renal transplant patient to treat AL after gastrectomy.

Conclusions

EVT has gained increasing recognition as a non-surgical approach for management of AL. Comorbidities in patients at high risk for AL and with a hostile abdomen can severely affect healing of the anastomosis, increasing the risk of AL. Treatment of an AL in the upper GI tract demands an individualized approach, and surgeons should be familiar with every option available. EVT appears to be a promising endoscopic option, with a high clinical success rate, avoiding the detrimental effects of a reoperation. However, although it can be a reproducible technique in experienced hands, even when commercial sponges are not available, surgeons should be aware of its potential complications. To conclude, more surgeons and clinicians should be aware of this emerging technique that can be applied in complex and challenging cases in patients with impaired wound healing like the one presented in this case report.

Patient Consent

The patient gave informed written consent.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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