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Multimodal Endoscopic Management of Fistula after Sleeve Gastrectomy Involving a Novel Esophageal Stent

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Keywords
Vertical gastrectomy · Fistulas · Endoscopic management · Stents

Abstract

Introduction: Laparoscopic sleeve gastrectomy (LSG) is a bariatric surgical procedure associated with a non-negligible risk of postoperative adverse events, especially fistulas, the majority of which occur at the angle of His. This adverse event requires a multidisciplinary approach involving intensive care, surgery, interventional endoscopy, and radiology. Despite the absence of an algorithmic endoscopic approach, a primarily endoscopic management of fistulas after LSG is now standard of care in most institutions. ***Case Report:*** A 66-year-old female with grade III obesity, obstructive sleep apnea, type 2 diabetes, and hypertension underwent LSG. She developed abdominal pain, hypovolemic shock, and severe anemia (Hb 6.5 g/dL). A computed tomography (CT) scan revealed hemoperitoneum without active bleeding, managed with transfusion of packed blood cells. A week later, a new CT scan performed for leukocytosis and abdominal pain revealed pneumoperitoneum. An esophagogastroduodenoscopy revealed a 20-mm fistula orifice at the angle of His. A novel esophageal covered metallic stent was placed for a period of 5 weeks. The fistula orifice decreased to 4 mm and communicated through a fistulous tract with a residual subphrenic abscess measuring 62 × 20 mm. Pus was collected from the abscess and drained internally with a 10-Fr double pigtail plastic stent through the fistula orifice. Following an initial period of improvement, clinical deterioration required percutaneous subphrenic abscess drainage. Two weeks later, the double pigtail plastic stent was removed, the fistula orifice was ablated with argon plasma 40W/1L and closed with an over-the-scope clip of 10 mm. Patient improved and was discharged 4 months after the LSG. ***Conclusion:*** The Luso-Cor esophageal stent is a specifically designed covered metallic stent with a 5-mm uncovered ring near the proximal edge, which reduces the risk of migration. Two articulating zones in the middle portion allow better adaptation to altered anatomy after LSG and a distal flare reduces retrograde reflux of fluid. This stent overcomes strictures in the gastric tube, concomitantly present in nearly 50% of patients with fistulas after LSG. The novel Luso-Cor esophageal stent provided a bridge to clinical stability with a significant reduction in the size of the fistula orifice which was closed with complementary therapeutic endoscopic procedures.

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Manejo endoscópico multimodal de fístula após gastrectomia vertical envolvendo uma nova prótese esofágica

Palavras Chave
Gastrectomia vertical · Fístulas · Manejo endoscópico · Prótese

Resumo

Introdução: A gastrectomia vertical laparoscópica (GVL) é uma cirurgia bariátrica associada a um risco não negligenciável de eventos adversos pós-operatórios, especialmente o desenvolvimento de fístulas, a maioria das quais ocorre no ângulo de His. Este evento adverso requer uma abordagem multidisciplinar envolvendo cuidados intensivos, cirurgia, endoscopia de intervenção e imagiologia de intervenção. Apesar de não existirem algoritmos de abordagens, o manejo primariamente endoscópico das fístulas após a GVL é atualmente o padrão de tratamento na maioria das instituições. ***Apresentação do caso:*** Uma mulher de 66 anos com obesidade grau lll, apneia obstrutiva do sono, diabetes tipo 2 e hipertensão arterial foi submetida a GVL. Ela desenvolveu dor abdominal, choque hipovolémico e anemia grave (Hb 6.5 g/dL) no pós-operatório. Uma tomografia computorizada (TC) revelou hemoperitoneu sem hemorragia ativa, tendo-se optado por uma atitude conservadora e suporte transfusional. Uma semana mais tarde, uma nova TC realizada por leucocitose e dor abdominal revelou pneumoperitoneu. A esofagogastroduodenoscopia (EGD) demonstrou um orifício de fístula com 20 m no ângulo de His. Foi decidida a colocação de uma nova prótese metálica coberta esofágica, tendo a mesma sido removida após 5 semanas. O orifício da fístula diminuiu para 4 mm e comunicava através de um trajecto com um abcesso subfrénico residual de 62 × 20 mm. O abcesso foi drenado internamente com uma prótese plástica duplo pigtail de 10Fr através do orifício da fístula. Após um período inicial de melhoria, a deterioração clínica exigiu a drenagem percutânea do abcesso subfrénico. Cerca de 2 semanas mais tarde, a prótese plástica duplo pigtail foi removida e o orifício da fístula foi ablacionado com árgon plasma 40W/1L e encerrado com uma *Over-The-Scope-Clip* de 10 mm. A doente melhorou e teve alta quatro meses após a LSG. ***Discussão:*** A prótese esofágica Luso-Cor® é uma prótese metálica coberta especificamente concebida com um anel não recoberto de 5 mm junto ao bordo proximal, o que reduz o risco de migração. Duas zonas de articulação na porção média permitem uma melhor adaptação à anatomia alterada após a GVL e um rebordo distal maior diminui o refluxo de fluido peri-prótese. Esta prótese permite dilatar as estenoses no tubo gástrico, presentes concomitantemente em cerca de 50% dos doentes com fístulas após GVL. A nova prótese esofágica Luso-Cor constituiu uma ponte para a estabilidade clínica com uma redução significativa do tamanho do orifício da fístula, que foi encerrado com procedimentos endoscópicos terapêuticos complementares.

Introduction

Laparoscopic sleeve gastrectomy (LSG) is a type of bariatric surgery involving the removal of two-thirds of the gastric volume along the greater curvature [1]. Weight loss after LSG in patients with obesity is probably due to a reduction in the gastric capacity as well as the modification of orexigenic and anorexigenic intestinal hormones [2].

Fistulas following LSG occur in 1–4% of patients with nearly 90% located at the angle of His [3–5].The angle of His is the zone with the highest intragastric pressure, with ischemia and dysfunctional peristaltic activity and strictures in the gastric tube contributing to fistula development [2, 6].

Fistulas after LSG can result in peritonitis, sepsis, respiratory insufficiency, long intensive care stays, and prolonged recovery with a mortality risk ranging between 8 and 37.5% [5, 7, 8]. A primarily stepwise endoscopic approach to manage fistulas after LSG is now considered the standard of care, with surgical peritoneal toilette being indicated for severely ill patients (e.g., septic shock) or after endoscopic failure [2–4, 9, 10]. Despite this, there is a lack of an algorithmic endoscopic approach and endoscopic interventions are often applied in a stepwise and institution-dependent manner according to the expertise of the interventional endoscopy team [3]. Endoscopic management of fistulas after LSG is often multimodal and requires several therapeutic endoscopic procedures prior to fistula closure [3, 11, 12].

Case Report

A 66-year-old female patient with a medical history of grade III obesity (body mass index 42.2 kg/m^2), obstructive sleep apnea, type 2 diabetes mellitus, and hypertension underwent LSG. The patient developed abdominal pain, hypovolemic shock, and severe anemia (hemoglobin 6.5 g/dL), on the first postoperative day. A computed tomography (CT) scan of the chest and abdomen revealed hemoperitoneum without active bleeding. She was transfused

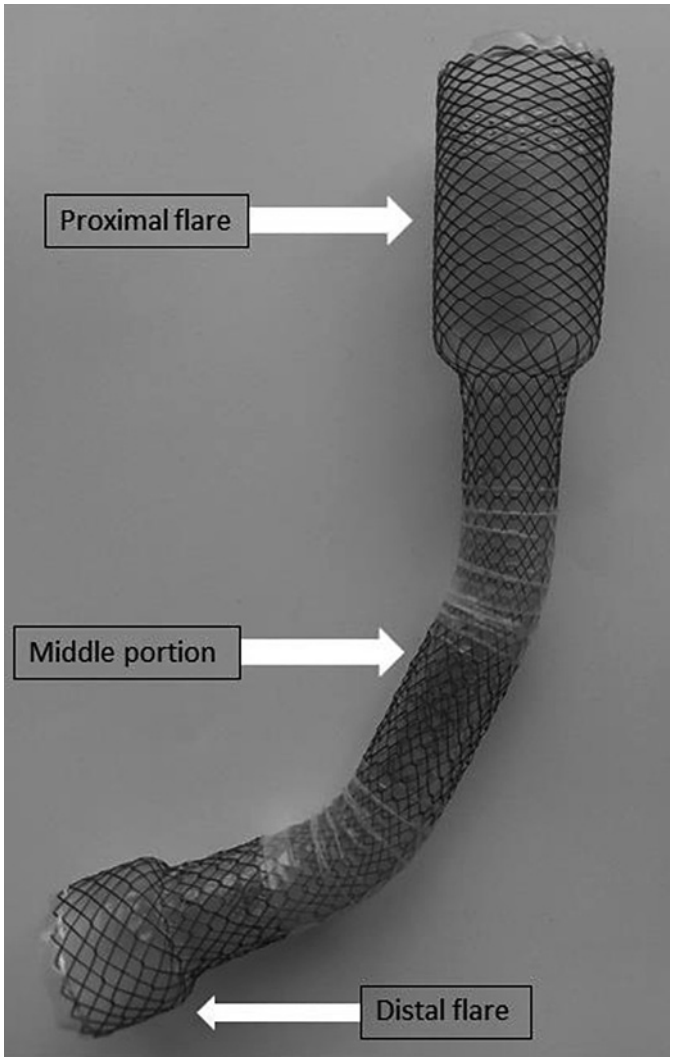

Fig. 1. Features of the Luso-Cor esophageal stent®.

with three units of packed red blood cells after which she remained hemodynamically stable with no signs of rebleeding and was therefore managed conservatively. A week later, due to leukocytosis, increased inflammatory markers and persistence of abdominal pain without guarding, rigidity, or tenderness, a new CT scan was performed, and it revealed evidence of pneumoperitoneum.

Given the suspicion of the development of a fistula, an esophagogastroduodenoscopy (EGD) was performed 8 days after surgery. This revealed a fistula orifice measuring 20 mm at the angle of His. Due to the considerable dimensions of the fistula, a novel covered metallic stent (Luso-Cor esophageal stent© 34/20/30 × 240 mm) was placed (shown in Fig. 1, 2). Laparoscopic peritoneal toilette was performed with placement of abdominal drains.

One month after LSG, the patient experienced an in-hospital complication due to sepsis and acute respiratory distress syndrome, requiring admission to the intensive care unit. Five weeks after the initial EGD, the stent was removed. The fistula orifice persisted but was considerably smaller, measuring 4 mm and communicating through a fistulous tract with a residual subphrenic abscess measuring 62 × 20 mm, as documented on CT scan (Fig. 3). After probing the fistula orifice with a guidewire and catheter, pus was collected from the subphrenic abscess which was then drained internally with a 10-Fr double pigtail plastic stent (Fig. 4). The microbial culture of the pus revealed carbapenemase-producing *E.coli*. Due to an increase of inflammatory markers and the possibility of sepsis, percutaneous ultrasound-guided drainage of the subphrenic abdominal collection was performed with isolation of *K. pneumoniae*, *K. aerogenes*, and *E. faecalis*, requiring adjustment of antibiotics.

Two weeks after the second EGD, a third one was performed, and the double pigtail plastic stent was removed. The fistula orifice was ablated with argon plasma 40W/1L and closed with an Ovesco® type T-10 mm over-the-scope clip (Fig. 5). Enteral nutrition was maintained with a nasojejunal feeding tube. A fourth EGD performed 2 weeks later revealed dislodgement of the over-the-scope clip from the fistula orifice. Argon plasma 40W/1L was again applied on the fistula orifice. A second ultrasound-guided percutaneous drainage of the residual subphrenic fluid collection was conducted. The patient improved, and 2 weeks later, the subphrenic collection had resolved. She was discharged 4 months after the LSG.

Discussion

Our patient presented with a fistula at the angle of His following LSG, resulting in significant morbidity, including pneumoperitoneum, sepsis, and subphrenic abscess, requiring a prolonged hospitalization as well as an intensive care unit stay. These complications were managed with several interventional endoscopic procedures and multiple devices including a novel esophageal stent, in addition to laparoscopic peritoneal toilette, intensive care support, and ultrasound-guided drainage of abdominal collections by interventional radiology.

Endoscopic management of fistulas offers several advantages compared to surgery. It is minimally invasive, unaffected by the patient's body mass index and does not induce local inflammation due to the surgical suturing of the fistula orifices [4, 9]. The early endoscopic internal drainage of abdominal abscess with double pigtail stents should be preferred to percutaneous drainage since it

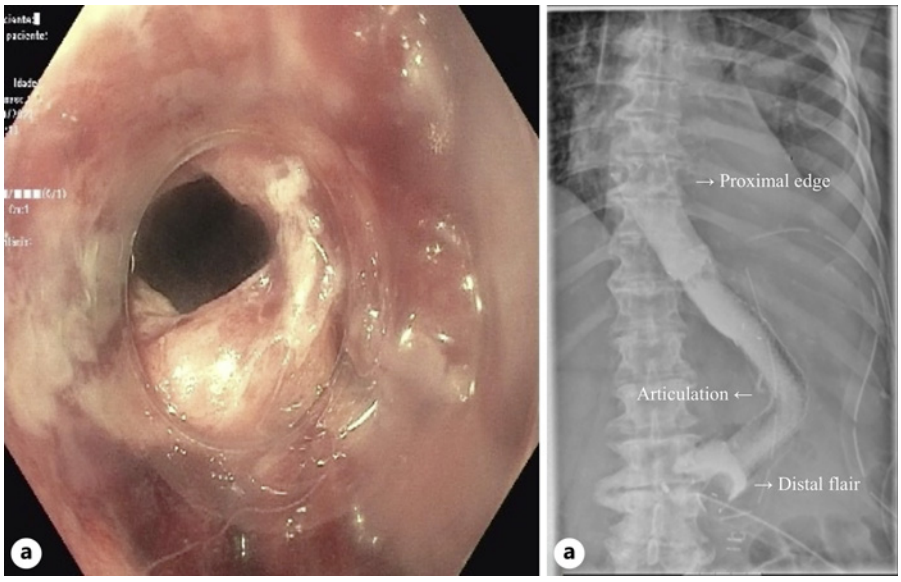

Fig. 2. a Fistula orifice measuring 20 mm at the angle of His at index endoscopy. **b** Esophageal contrast study showing effective exclusion of the fistula orifice by the Luso-Cor esophageal stent©.

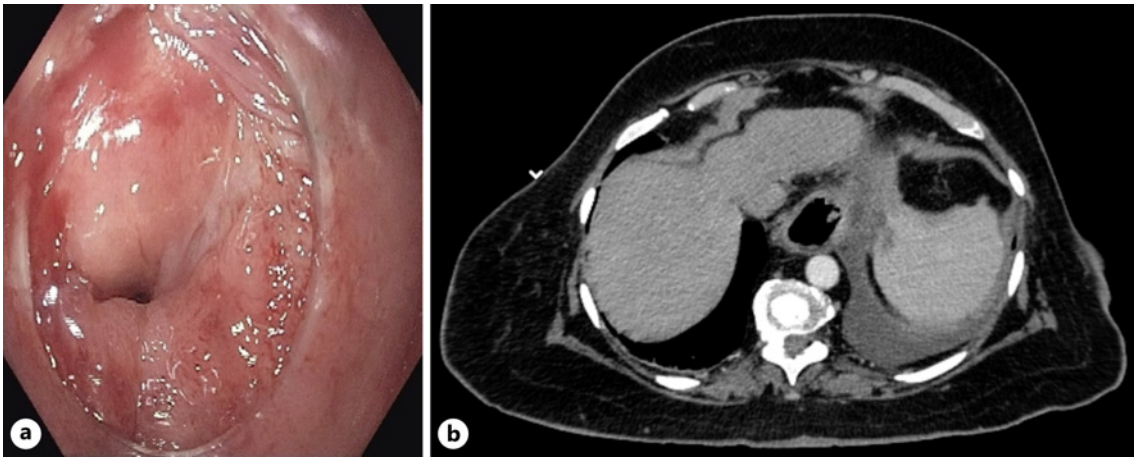

Fig. 3. a Fistula orifice measuring 4 mm after stent removal, 5 weeks later. **b** CT scan showing the subphrenic abscess measuring 62 × 20 mm.

appears to be an effective and well-tolerated first-line intervention with favorable long-term outcomes, shorter hospitalization, and a reduced risk of chronic gastric fistula [13]. Endoscopic internal drainage can be eventually followed by percutaneous drainage in case of persistence of abdominal collections. This step-up approach allows the resolution of inflammatory processes with subsequent closure of the fistula orifice [4, 5, 11, 12]. The use of concomitant and sequential therapeutic endoscopic techniques including stent placement, clip closure, and endoscopic suturing achieves the resolution of fistulas with minimal morbidity and avoids more aggressive surgeries such as gastrectomy [2–6, 11, 14]. Endoscopic strategies based on the size, position, and location of the fistula orifice or timing of endoscopy have been suggested, but often multimodal and stepwise endoscopic therapy with the sequential use of various devices and multiple EGDs is required [3, 9, 11, 12, 14]. The combination of therapeutic endoscopic techniques, rather than a single endoscopic therapy, has increased clinical success, achieving fistula orifice closure in 70–90% of cases [3, 12]. While it would be beneficial to identify the most effective technique, this can be challenging, as often multiple endoscopic techniques have to be used while managing complex fistulas. Therefore, it is important to consider them as complementary rather than competing techniques [3].

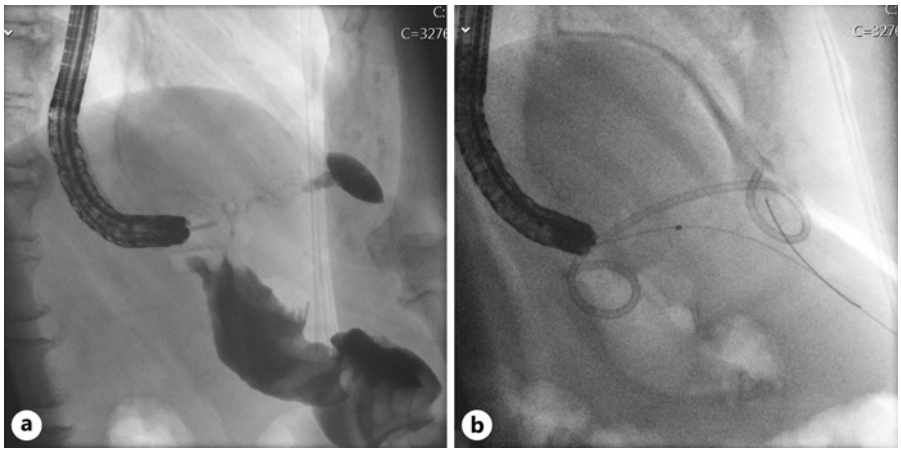

Fig. 4. a Probing of the fistula orifice with a guidewire and catheter that showed the fistula tract and the subphrenic abscess. **b** Internal drainage of the abscess with a 10-Fr double pigtail plastic stent.

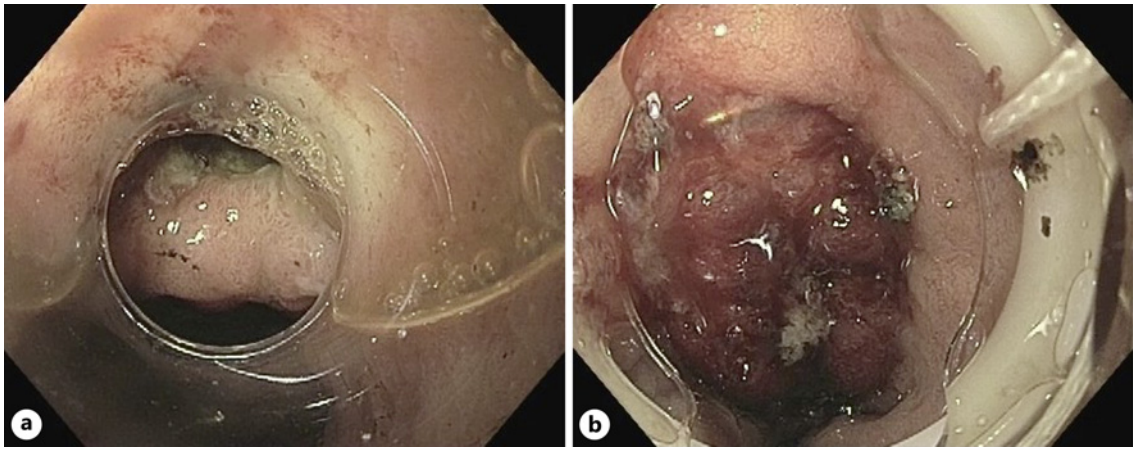

Fig. 5. a Residual fistula orifice measuring 5 mm. **b** Fistula orifice closed with an over-the-scope clip of 10 mm after applying argon plasma.

The novel Luso-Cor esophageal stent© (MI Tech®) was used in our patient. This is a specifically designed covered stent with a 5-mm uncovered ring situated 1 cm below the proximal edge of the 6 cm long proximal flared segment, which is available in 30, 34, and 36 mm diameters. Circumferential mucosal ingrowth occurs within 72 h and seals the circumference of the stent, preventing peri-stent seepage and reducing the risk of migration. The stent has a middle narrow segment, 20 mm in diameter and measuring 16 cm in length, and has two articulating zones that can bend up to 90o, allowing better adaptation to the altered anatomy after LSG. The distal flare measures 2 cm in length and has a 30 mm diameter which allows coaptation of that portion of the stent to the prepyloric antrum reducing the risk of retrograde reflux of enteric fluid [15]. This contrasts with the Hanarostent bariatric surgery stent (CCC)® which has a single articulating zone at the junction of the narrower proximal segment which is 24 mm in diameter with a proximal flare of 28 mm diameter which rests in in the distal esophagus and the distal longer segment which is wider, with a 28 mm diameter and a distal flare measuring 32 mm.

The Luso-Cor esophageal stent© should be placed using the over-the-wire technique, with the distal edge positioned at least 2 cm proximal to the pylorus and the proximal flare at least 2 cm above the esophagogastric junction [15]. The stent should remain in situ for a minimum of four and a maximum of 12 weeks. It can be easily removed by ablating the mucosal ingrowth with argon plasma (50W/1L) applied at the 5-mm uncovered portion near the proximal edge, followed by the removal of mucosal debris with a cap applied at the tip of the endoscope [15].The stent is then easily removed by grasping the lasso at the proximal edge of the stent with a

rat tooth forceps. The Luso-Cor esophageal stent© was designed to take into consideration the altered anatomy after bariatric surgery and surgery for gastric cancer [15]. Its unique design allows for dilatation of strictures in the gastric tube, which may be concomitantly present in nearly 50% of patients with fistulas following LSG [15].

The success of a primary endoscopic approach to fistula management after bariatric surgery depends also on the technical expertise of the center. This underscores the importance of specialized interventional endoscopists and high-volume centers to provide the best quality of care [4, 10, 14].

In conclusion, we believe that multimodal therapeutic endoscopy is the key for effective management of fistulas following bariatric surgery. It is recommended that patients should be offered a personalized multidisciplinary management strategy based on the size and characteristics of their fistulas and clinical condition [4, 9–11, 16]. The novel Luso-Cor® esophageal stent played a crucial role as a bridge to clinical stability, contributing to a significant decrease in the size of the fistula orifice, which was then closed with complementary therapeutic endoscopic procedures.

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Statement of Ethics

The Ethics Committee of Hospital Santa Maria approved the case report, with Ref No. 74/24, date 12/08/24. Informed consent from the patient was obtained for the publication of this case report.

Conflict of Interest Statement

Carlos Noronha Ferreira designed and co-patented the Luso-Cor esophageal stent® with MI Tech®. The remaining authors do not have any conflicts of interest.

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Author Contributions

Claudia Fortunato, MD: preparation of the manuscript and critical revision for intellectual content. Carlos Noronha Ferreira, MD, MSc, PhD: clinical and endoscopic interventions and critical revision for intellectual content. Miguel Moura, MD: endoscopic interventions and critical revision for intellectual content. Amélia Almeida, MD: clinical intervention and critical revision for intellectual content. Rui Tato Marinho, MD, PhD, and Luís Correia, MD: critical revision for intellectual content.

Data Availability Statement

Data will be available upon request.

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