

Laparoscopic Treatment of a Huge Epiphrenic Esophageal Diverticulum: A Case Report and Literature Review

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AIM: Epiphrenic diverticulum (ED) is a rare benign esophageal disorder commonly associated with esophageal motility conditions, such as achalasia. Esophagogastroduodenoscopy (EGDS), barium esophagography, and esophageal high-resolution manometry (HRM) are essential for accurate diagnosis. Surgical intervention is the standard treatment for symptomatic patients.

CASE PRESENTATION: We present the case of a 61-year-old man with a large epiphrenic diverticulum presenting with dysphagia and chest pain. Medical therapy was ineffective; therefore, the patient underwent laparoscopic diverticulectomy, hiatoplasty, Heller myotomy, and Dor fundoplication.

RESULTS: Complete resolution of symptoms was achieved, significantly improving the patient's quality of life, with no perioperative complications.

CONCLUSIONS: The diagnosis and management of epiphrenic diverticula require a multidisciplinary approach. Abdominal laparoscopic surgery is a safe and effective option, with a low risk of complications and good symptom resolution.

Keywords: epiphrenic diverticulum; esophageal diverticula; Dor fundoplication; Heller's myotomy; case report

Introduction

Among esophageal diverticula, epiphrenic diverticula (ED) are located within the last 10 cm of the esophageal hiatus [1]. Epidemiologically, they represent approximately 20% of all esophageal diverticula (Fig. 1) [2–4]. Structurally, ED are typically composed of mucosa and submucosa, forming a rounded shape in a sloping position. Therefore, they are referred to as diverticula [5–7].

The etiology involves an increase in intraesophageal pressure, likely secondary to esophageal motility disorders such as achalasia, diffuse esophageal spasm, hiatal hernia, or gastroesophageal reflux disease (GERD) [1,8]. ED may be asymptomatic or symptomatic, as shown in Table 1 [9,10]. Prodromal symptoms include heartburn, hiccups, and digestive difficulties [9,10]. Typical late-stage symptoms include dysphagia, regurgitation, chest pain, and dyspnea [11–13].

Radiologically, ED appear as saccular extrusions with a narrow neck, sloping base, and diaphragmatic location [11,13]. Manometric evaluation is necessary to identify underlying esophageal motility disorders [5,14].

The primary therapeutic approach focuses on addressing esophageal motility abnormalities [14,15]. Surgical intervention, including diverticulectomy, cardiomyotomy, and anti-reflux procedures [6,15–21], is indicated when the diverticulum is symptomatic or has a narrow neck [6,15,16]. We report the case of a 61-year-old man (weight, 45 kg; height, 163 cm) diagnosed with a 6.6 cm ED using digestive endoscopy. The condition was successfully managed laparoscopically. This case has been reported in line with the Case Report (CARE) Guidelines to ensure the accuracy and completeness of the report (**Supplementary material**) [22].

Case Presentation

A 61-year-old Italian man presented to Federico II University Hospital with a primary complaint of reflux, nausea, and vomiting episodes for approximately one year, associated with epigastric pain. Additionally, he reported difficulty swallowing solid foods. Previous drug therapy with dopamine antagonists had been ineffective, with minimal symptom resolution.

The patient had undergone right inguinal hernioplasty and hemorrhoidectomy. His medical history included arterial hypertension, retrograde amnesia, and hiatal hernia. He had no known drug allergies. A family history of diabetes was reported, but there was no history of gastrointestinal neoplasms or related conditions. The patient had been a smoker for six years.

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Relative incidence of esophageal diverticula

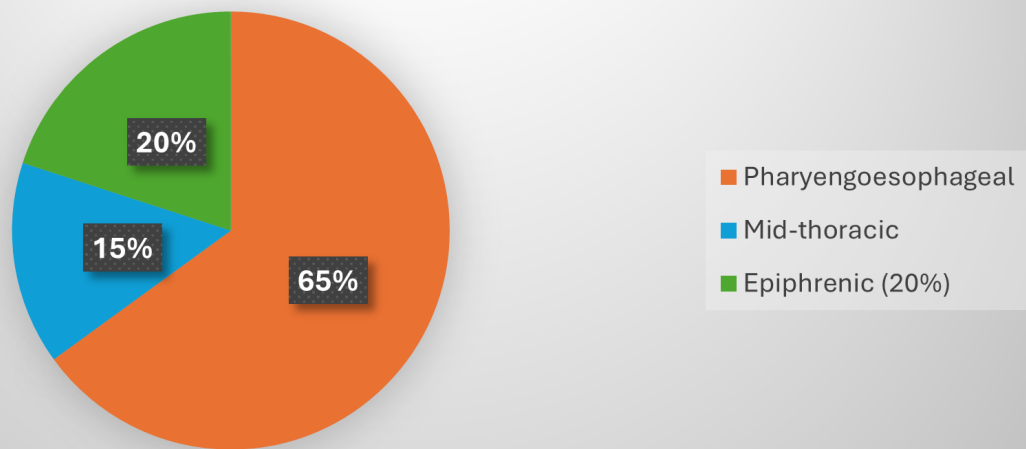


Fig. 1. Relative incidence of esophageal diverticula.

Table 1. Symptoms of epiphrenic esophageal diverticula.

Nonspecific prodromal symptoms	Typical symptoms
Hiccups	Halitosis
Heartburn	Dysphagia and regurgitation
Difficulty in digestion	Chest pain

Upon initial examination, the patient was in good general health, stable, afebrile, acyanotic, anicteric, and well-hydrated, with normal vital signs. His muscle mass was hypotonic. He weighed 45 kg. Physical examination revealed no abnormal respiratory or cardiac findings. The abdomen was flat and soft, with tenderness in the right hypochondrium and epigastrium. No palpable masses, peritoneal irritation signs, or scars from the previous inguinal hernioplasty were noted.

Six months prior to surgery, esophageal radiography with barium revealed a large rounded formation near the right wall of the distal esophagus, with contrast stasis and reflux from this formation. The differential diagnoses included hiatal hernia and epiphrenic esophageal diverticulum. Five months before surgery, esophagogastroduodenoscopy (EGDS) showed a large cavity with a diverticular appearance in the paracardial region. Four months before surgery, a chest radiograph revealed a rounded opacity at the right retrocardiac site, compatible with an ED. EGDS performed the day before surgery showed saccular dilation approximately 3–5 cm from the Z line near the distal esophagus, with a difficult-to-detect collar (Fig. 2). A total body Computed Tomography (CT) scan conducted the day before surgery confirmed a gross diverticular outpouching near the lower third of the thoracic esophagus (maximum diameter, 6.6 cm), with the diverticular ostium located 3–5 cm from

the diaphragmatic pillars. The diverticulum extended cranially to the subcarinal region. High-resolution esophageal manometry (HRM) demonstrated a peristaltic disorder with wavefront interruption in the distal esophagus, consistent with ED (Fig. 3).

The patient underwent laparoscopic abdominal surgery. After placing five trocars, exploration of the abdominal cavity revealed a small hiatal hernia. The Bertelli's phreno-esophageal membrane was opened, and the pars flaccida of the lesser omentum was sectioned. The diaphragmatic pillars were separated from the esophagus via esophageal retroassage and suspended on tape. The mediastinal esophagus was isolated from the aortic plane. A large diverticular sac was isolated near the lower third of the esophagus. The dissection was challenging due to adhesions between the sac and the right pleura, which required traction (Fig. 4). Endoscopic control was performed during the diverticulum sectioning with a linear stapler (Ethicon Echelon™, Ethicon Inc., Cincinnati, OH, USA) charged with 60 staples (Figs. 5,6). Suturing and hemostasis were monitored. A wide extramucosal Heller's esophageal-gastric myotomy was then performed (Fig. 7), followed by intra-operative endoscopy to ensure mucosal integrity. Finally, hiatoplasty and Dor fundoplication were carried out with separate stitches and controlled hemostasis (Figs. 8,9). A transhiatal mediastinal drain was placed in the right flank.

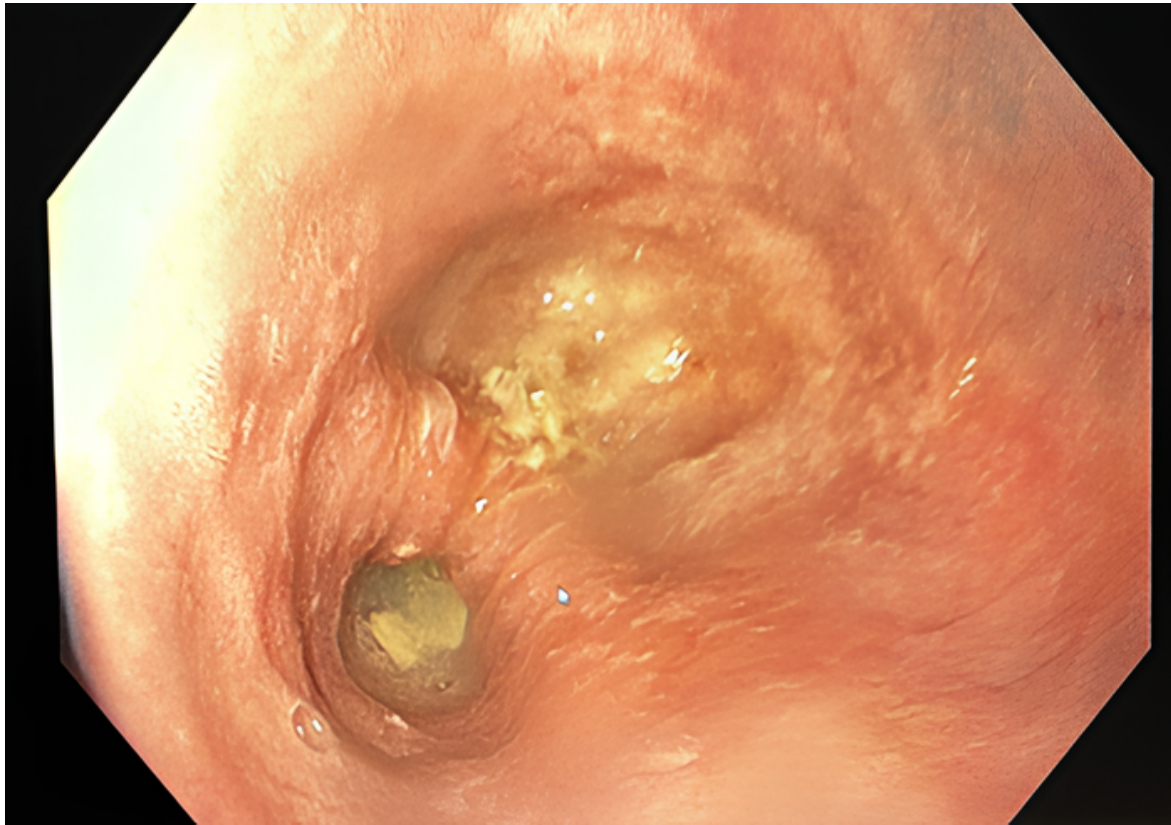


Fig. 2. Preoperative esophagogastroduodenoscopy (EGDS).

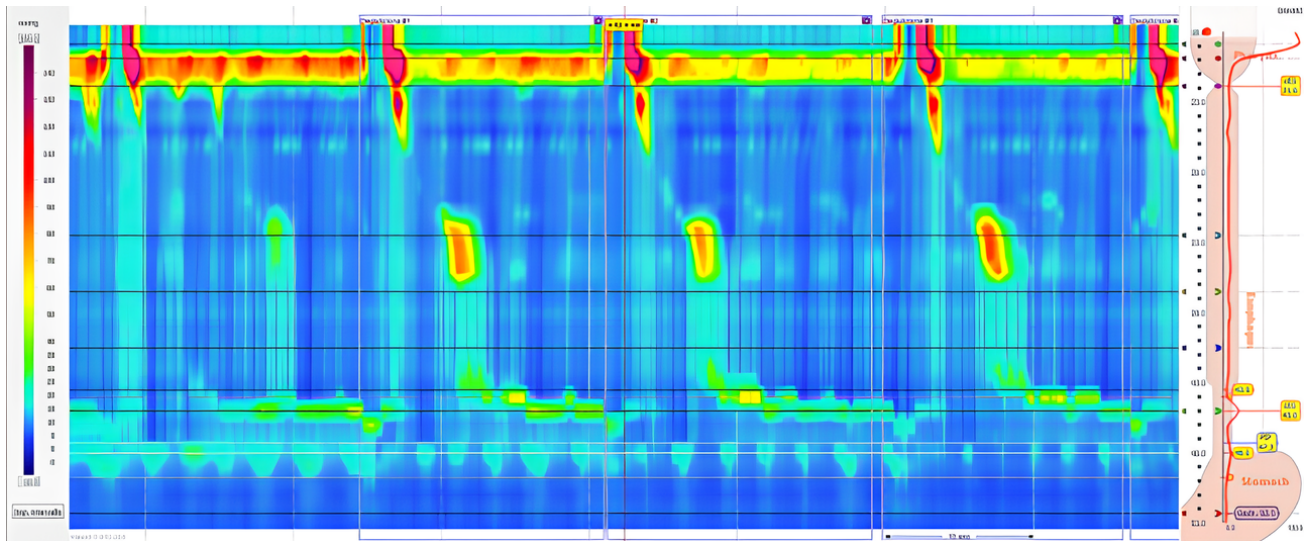


Fig. 3. Preoperative esophageal high-resolution manometry (HRM).

The five trocars were removed, and the monofilament trocar ports were closed in multiple layers. Histopathological examination confirmed the diagnosis of esophageal diverticulum, showing hyperplastic epithelium with congestion and chronic inflammation.

Postoperatively, the patient experienced complete symptom resolution. The bladder catheter was removed on postoperative day one. Early mobilization and radiographic examination were performed on the same day. Antibiotics and

antithrombotic therapy were administered. On the second postoperative day, a methylene blue test was performed, yielding negative results. The patient remained on fasting until postoperative day five. On that day, abdominal CT of the esophagus was conducted, which revealed the presence of the suture crown in the epiphrenic area, absence of gastroesophageal reflux, and normal gastric fundus opacification. The oral diet was initiated in consultation with the nutrition and physiotherapy teams.

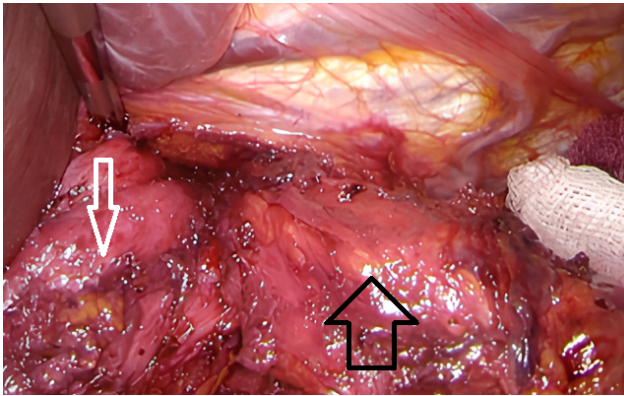


Fig. 4. Epiphrenic diverticulum (ED) (white arrow) before dissection and separation from the esophagus (black arrow).

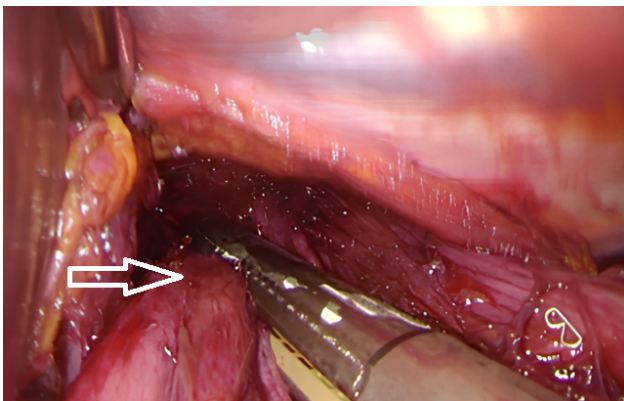


Fig. 5. Intraoperative image showing the clamped ED (white arrow).

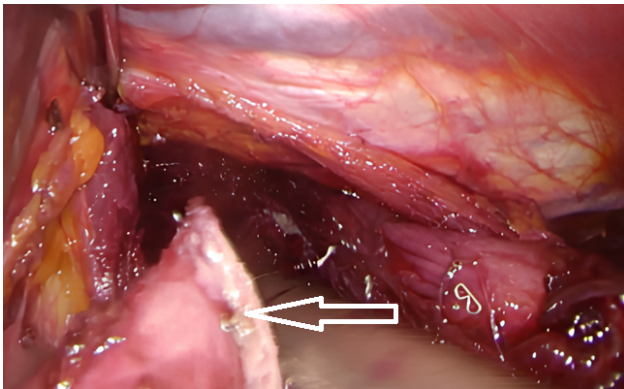


Fig. 6. Outcome following the resection of the ED (white arrow).

Initially, a semi-liquid diet was prescribed until one week after discharge. On the sixth postoperative day, the abdominal drain was removed. The patient was discharged on postoperative day seven. Two weeks after discharge, the patient transitioned to a semi-solid diet, and from the third week after discharge, the diet was normalized. The semi-liquid diet consisted of non-chewable, fluid, homogeneous, blended foods that could not be picked up with a fork, such

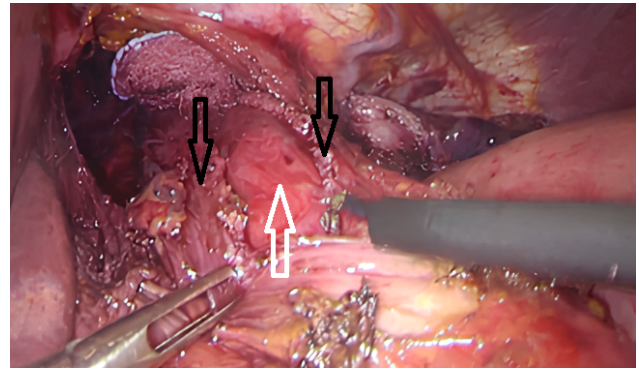


Fig. 7. Heller myotomy: esophageal mucosa (white arrow) and esophageal musculature (black arrow).

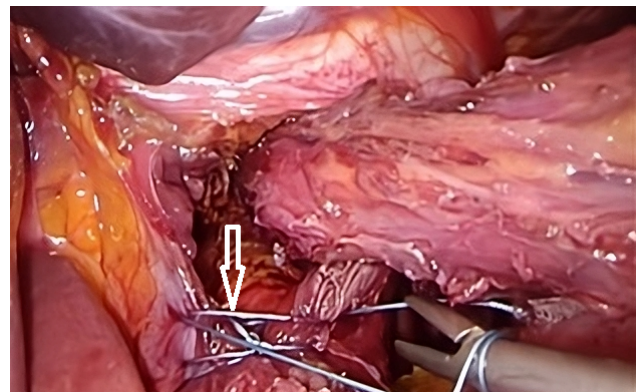


Fig. 8. Hiatoplasty (white arrows).

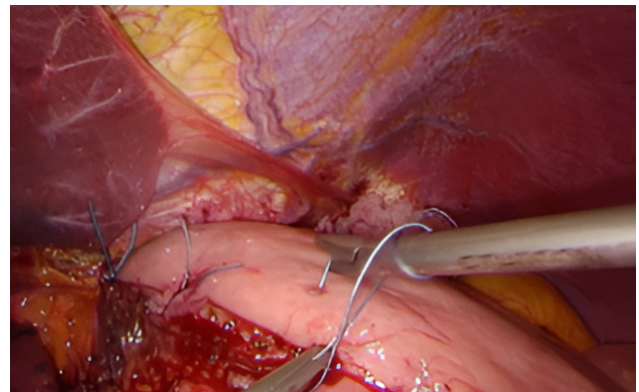


Fig. 9. Dor Fundoplication.

as water, tea, juices, smoothies, broths, soups, or teas. The semi-solid diet included foods of similar consistency that could be picked up with a fork or spoon, such as purees, puddings, baby food, and soft cheeses. The patient was followed weekly postoperatively. After one year, manometric parameters showed improvement, and symptoms were fully resolved. The patient is currently under the care of a gastroenterologist.

Discussion

ED is defined as the extrusion of esophageal mucosa and submucosa through the esophageal muscular layers [14,15,23]. It is typically located within the last 10 cm of the thoracic esophagus [14]. ED is classified as a type of pulsion diverticulum, characterized by increased intraluminal esophageal pressure [24]. Epidemiologically, the prevalence of ED is equal between males and females, with a higher frequency in adults [20]. It represents approximately 20% of all esophageal diverticula, and its diagnosis is often incidental during radiographic or endoscopic evaluations [14,17,18,25]. The ED is predominantly located on the right posterolateral wall of the distal esophagus [25]. Although its etiology remains unclear, ED is frequently associated with primary or secondary esophageal dyskinesia [14]. Increased intraluminal esophageal pressure is a hallmark feature of this diverticulum [13]. ED may also be associated with esophageal motility disorders such as achalasia, hypertensive lower esophageal sphincter (LES), and diffuse esophageal spasm in 46%–100% of cases [6,8,13,23,26].

Most ED are asymptomatic or present with few symptoms [27]. Nonspecific prodromal symptoms include coughing, hiccups, heartburn, and digestive difficulty [14,25]. It is rarely associated with cardiac issues such as arrhythmias [28]. Specific symptoms include dysphagia, regurgitation, chest pain, and halitosis [22]. In many cases, patients experience weight loss [1]. Complications may include inflammation, ulceration, and ED rupture [1]. Untreated ED can, in rare instances, progress to neoplasia [19].

The correct diagnostic evaluation involves EGDS, barium esophagography, and HRM [16]. EGDS is essential for confirming the presence of ED and ruling out associated diseases [14,19,24]. Barium esophagography is useful for assessing the shape, size, and location of the diverticulum. Chest CT enhances the anatomical resolution of ED, allowing detailed assessment of its dimensions and relationship to surrounding structures [4,5]. HRM is critical for evaluating esophageal motility disorders concurrent with ED, such as achalasia and diffuse esophageal spasm [11]. At our center, we routinely perform HRM in patients with suspected esophageal motility disorders. In this case, esophageal manometry revealed a disorder of esophageal peristalsis with interrupted wavefronts. Consistent with the literature, we emphasize the importance of esophageal manometry in all patients with radiological or endoscopic suspicion of ED, though some authors have noted uncertainties regarding its use [13,29,30].

Treatment is based on the patient's symptoms [4]. Asymptomatic patients require careful monitoring [14]. However, some studies suggest surgical removal even for asymptomatic ED, due to the low risk of neoplastic degeneration [31,32]. Patients with mild or few symptoms may benefit from pharmacological therapy using dopamine antagonists [14,15]. For patients who are symptomatic or unresponsive

to pharmacological treatment, surgical intervention is necessary. Currently, laparoscopic abdominal surgery is considered the preferred treatment approach [33]. This technique has largely replaced the traditional left thoracotomy, in which diverticulectomy, myotomy, and Belsey Mark IV plasty were performed [34–38]. As demonstrated in this case, the use of a flexible endoscope prior to diverticulectomy is recommended, as it allows for insufflation, desufflation, and transillumination of the diverticular pocket [6–8,39]. These maneuvers aid in the isolation of the diverticulum until it reaches its collar. Many authors perform diverticular dissection with a linear stapler only after completely detaching the diverticular sac from the pleural and mediastinal tissues [2,4,7,15,18,20,25,39,40]. We concur with this approach. After these maneuvers, endoscopic control confirmed the absence of mucosal perforation [3,23,24,41]. In addition to diverticulectomy, the standard surgical management includes Heller's myotomy and Dor fundoplication [15,16]. Heller's myotomy has been shown to alleviate esophageal motility disorders, reduce intraesophageal pressure, and relieve functional outflow obstruction, which may contribute to the development of ED [15,21,26,42]. Dor fundoplication, on the other hand, decreases the risk of postoperative gastroesophageal reflux, as well as migration, torsion of the stomach in the diaphragmatic hiatus, and inflammation or fibrosis at the gastroesophageal junction [20,21]. As a result, Dor fundoplication is preferred by most surgeons [16]. In some cases, Toupet fundoplication is performed, particularly for patients with concomitant hiatal hernias [8,15,18]. The combination of diverticulectomy with Heller's myotomy and Dor fundoplication yields the most favorable functional outcomes [3,23,41]. In this case, the patient underwent both Heller's myotomy and Dor fundoplication following diverticulectomy. In certain situations, a transthoracic approach may be required, particularly in cases of intra-abdominal adhesions, prior abdominal surgery, large diverticular necks, anatomical anomalies, multiple diverticula, or adhesions [42].

Conclusions

ED is a rare pathological condition that is often associated with esophageal motility disorders and/or increased intraluminal pressure. A correct differential diagnosis requires a combination of clinical suspicion, radiological imaging, endoscopy, and manometry. Treatment decisions should be based on the severity of symptoms and managed by a multidisciplinary team, including surgeons, gastroenterologists, radiologists, physiotherapists, and nutritionists. In cases where pharmacological therapy fails to resolve symptoms, surgical intervention becomes necessary. Postoperative follow-up is critical, with regular weekly and monthly outpatient visits. The laparoscopic transabdominal approach is a safe and effective treatment option, offering favorable functional outcomes and an acceptable risk profile.

Availability of Data and Materials

All experimental data included in this study can be obtained by contacting the corresponding author if needed.

Author Contributions

AF, GP, GDDP, GA designed the research study, acquired data and performed the research. GP critically reviewed, edited, and wrote the manuscript. MC analyzed the data. GDDP edited the manuscript. GA conceived the study, wrote, reviewed, edited, and drafted the manuscript. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The patient has given his informed consent for the anonymous use of his data and our study is in accordance with the Declaration of Helsinki.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at <https://doi.org/10.62713/ai.c.3802>.

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