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Minimal invasion thoracic management of esophageal diverticulum. Case report and literature review

Manejo torácico del divertículo esofágico por mínima invasión. Reporte de un caso y revisión de la literatura

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Palabras clave:
Divertículo esofágico, tratamiento endoscópico del divertículo esofágico, manejo laparoscópico.

ABSTRACT

Esophageal diverticula are evaginations of the esophageal wall in the form of a blind pouch that communicates with the lumen. They are rare, with a reported prevalence of 0.06-4%, and are usually incidental findings during endoscopic surveillance. Their peak incidence is in the fifth decade of life; they affect both men and women equally. **Case report:** In a seventy-three year old female a minimally invasive thoracic approach was performed. Blunt and sharp dissection was made, identifying an epiphrenic diverticulum with a 5 cm base. The lesion was dissected; the resection was performed using a linear laparoscopic stapler. Total surgical time was 280 minutes, with transoperative bleeding of 100 cm^3. There were no complications and the patient was transferred to the recovery room without the need for ventilatory support. **Conclusion:** Laparo-endoscopic management with minimally invasive diverticulectomy and a prophylactic esophageal prosthesis is a feasible option. This approach may lower associated morbidity in high-risk patients. The possible complications of the surgical treatment should always be taken into consideration, and management of these will depend on the patient's clinical condition and the available hospital resources.

RESUMEN

Los divertículos esofágicos son evaginaciones de la pared esofágica en forma de bolsa ciega que comunican con la luz principal. Son raros, tienen una prevalencia reportada de 0.06 a 4%; generalmente son hallazgos circunstanciales cuando se examina el esófago de forma endoscópica. Presentan un pico de incidencia a partir de la quinta década de la vida y afectan tanto a hombres como a mujeres. ***Caso clínico:*** *Paciente femenino de 73 años de edad. Se realizó un abordaje torácico de mínima invasión. Se llevó a cabo una disección roma y cortante; se identificó un divertículo esofágico epifrénico con base de 5 cm. Se disecó la lesión en su totalidad, efectuando la resección del divertículo con una engrapadora lineal laparoscópica. El tiempo quirúrgico total fue de 280 minutos, con hemorragia transoperatoria de 100 cm^3. No se evidenciaron complicaciones y la paciente fue egresada a recuperación sin necesidad de apoyo ventilatorio.* ***Conclusión:*** *El manejo laparoendoscópico con diverticulectomía de mínima invasión y colocación de una prótesis esofágica profiláctica del divertículo esofágico es una opción factible para esta patología. Este abordaje puede ofrecer menor morbilidad asociada en pacientes de alto riesgo. Siempre se deben tener en cuenta las posibles complicaciones del tratamiento quirúrgico, y su manejo dependerá de la condición clínica del paciente y los recursos disponibles del centro hospitalario.*

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INTRODUCTION

Esophageal diverticula are blind pouch-shaped esophageal wall outlets that communicate with the main lumen.[1] They are rare, with a reported prevalence of 0.06 to 4%; These are usually circumstantial findings when the esophagus is examined endoscopically.[1,2] They have a peak incidence from the fifth decade of life and affect both men and women.[2]

They are classified, according to their location,[3] in proximal (pharyngoesophageal or Zenker's), medium (epibronchial or parabronchial) and distal (epiphrenic); according to the layers of the esophageal wall involved (true diverticulum if it includes all the layers or pseudo-diverticulum if it includes only the mucosa or submucosa) and, finally, by the formation mechanism (drive or traction).[4]

Epiphrenic esophageal diverticula are those located in the distal third of the esophagus 10 cm from the gastroesophageal junction. They represent about 10-15% of all esophageal diverticula. They are usually formed by drive mechanisms and 70% grow towards the right side[5] of the esophagus, perhaps because the aorta and the heart inhibit its development towards the left side.[6]

We present a therapeutic proposal for the treatment of the epiphrenic esophageal diverticulum in a patient without esophageal motor disorder detected by manometry and with high surgical risk, treated in our hospital using a minimally invasive approach together with the placement of transoperative esophageal prostheses. We do a literature review.

CLINICAL CASE

A 73-year-old female, with a history of type 2 diabetes mellitus for seven years, under medical treatment and control with glibenclamide and metformin, with untreated ischemic heart disease, in addition to gastroesophageal reflux disease treated with a proton pump inhibitor (omeprazole, 40 mg every daily for five years). As surgical history, she reported two diagnostic laparoscopies; she did not know the reason for them.

Her condition began two months before her evaluation with a clinical picture characterized by dysphagia to solids and, later, to liquids, accompanied by occasional nausea and regurgitation of undigested food. She reported worsening of the symptoms, nighttime cough, oppressive chest pain associated with food intake, and weight loss of 12 kg.

She was evaluated at the General Surgery Service, where the study protocol was started; an upper GI endoscopy was performed, which showed an esophageal diverticulum 32 cm from the upper dental arch, with partially digested food inside, and an approximate diameter of 5 cm, in addition to chronic gastropathy predominantly in the body and antrum *(Figure 1)*. It was complemented with an esophageal manometry in which hypertonia of the lower esophageal sphincter was detected. A CT scan was performed *(Figure 2)*, which showed a

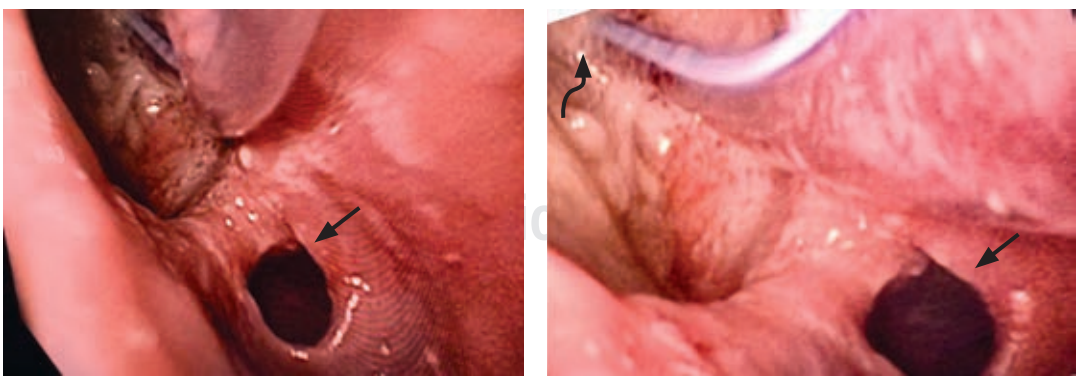

Figure 1: *Upper endoscopy showing the presence of an esophageal diverticulum (straight arrow) 32 cm from the upper dental arch. The esophagogastric junction (curved arrow) is less than 10 cm from the mouth of the diverticulum.*

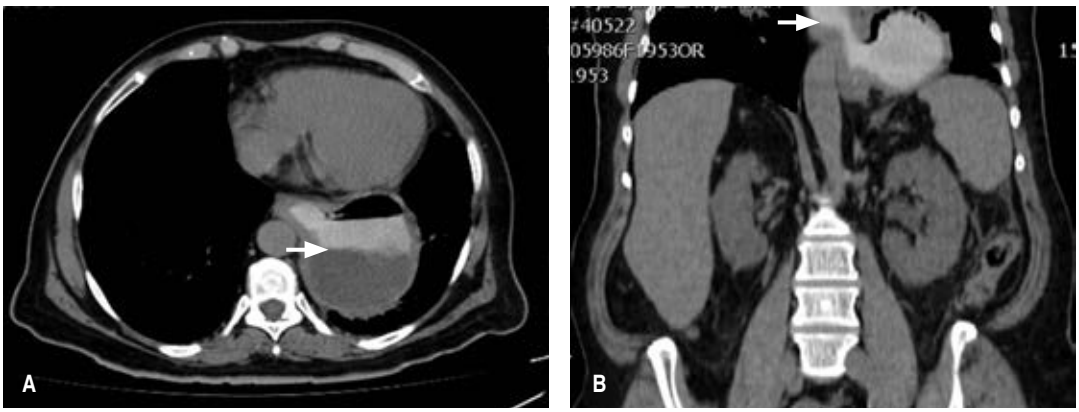

Figure 2: *Computed axial tomography with oral contrast in axial* ***(A)*** *and coronal* ***(B)*** *sections, where the presence of a paraesophageal saccular image is observed, with the presence of contrast material inside and which shows the presence of an air-fluid level in its interior (arrow).*

paraesophageal saccular image in the chest with an air-fluid level inside.

An esophageal diverticulum was diagnosed; surgical intervention was decided on a scheduled basis. Studies and necessary preoperative evaluations were completed; with an ASA III classification; for this reason, diverticulectomy was performed only.

A minimally invasive thoracic approach was performed in the supine position, placing three 12-mm trocars located in the fifth intercostal space on the left mid-axillary line (camera) and two in the anterior axillary line in the fifth and eighth intercostal spaces *(Figure 3)*. Blunt and sharp dissection was performed; An epiphrenic esophageal diverticulum with a base of approximately 5 cm and 10 x 6 cm in its major axes was identified; the lesion was completely dissected. The diverticulum was resected with a laparoscopic linear stapler *(Figure 4)*. As part of the approach, an intraoperative panendoscopy was performed, verifying the suture line showed no bleeding and performing a pneumatic test which showed no evidence of leakage. However, due to the patient's age and risk factors, comorbidities, nutritional status, and a greater likelihood of leakage, it was decided to place a partially covered self-expanding esophageal prosthesis in the distal third of the esophagus, including the suture line *(Figure 5)*.

Total surgical time was 280 minutes, with 100 cm^3 intraoperative bleeding; There were no complications. The patient was admitted to the recovery room without need for ventilatory support.

The patient presented a favorable evolution. An esophagogram was performed on the first postoperative day, without evidence of leakage and an adequate placement of the prosthesis, so a diet per os was started. She was discharged on the seventh postoperative day, with no apparent complications. The patient attended our service for control and follow-up 12 months after surgery.

DISCUSSION

Esophageal diverticula are herniations of the esophageal wall. Usually, they are classified by their location; however, they can also be classified into two types due to their formation mechanism: drive and traction.[7] Those of the drive type are the result of herniation through a weakness in the esophageal muscle wall due to transmural pressure, while those of the traction type are formed by inflammation and fibrosis of adjacent structures. Among the pulses are the Zenker's or pharyngoesophageal diverticulum and the epiphrenic or distal diverticulum.[7,8]

Epiphrenic esophageal diverticula are reported to be five times less frequent than pharyngoesophageal diverticula and consist of less than 10% of esophageal diverticula.[7] However, the exact incidence is unknown, as they are generally asymptomatic: only 15-20% of the patients present symptoms; it is common

to diagnose them incidentally during an X-ray or endoscopy performed for other reasons.[9]

The exact pathophysiology is still unknown; however, it is accepted that epiphrenic diverticula are caused by an increase in the intraluminal pressure of the distal third of the esophagus, which produces wide-ranging contractions and, eventually, a weakness in the wall of the esophagus, causing the formation of a true diverticulum.[3,6,9,10] This theory could be supported by the fact that between 75 and 90% of patients with epiphrenic esophageal diverticula present some type of motor disorder[10] (achalasia, hypertensive lower esophageal sphincter [LES], diffuse esophageal spasm, nutcracker esophagus, and nonspecific motor esophageal disorders)[11] and/or the presence of systemic diseases such as scleroderma or other collagen pathologies, where the esophageal walls lose elasticity and predispose the formation of these complications.[1,2]

The symptoms are variable; up to 30-40% of patients remain asymptomatic.[12] This disease is considered to produce symptoms when the diameter of the diverticulum is at least 5 cm,[13] with dysphagia, regurgitation (as in the patient) and pulmonary symptoms being the most characteristic. such as cough, laryngitis, expectoration and infectious processes due to aspiration.[4,5,12] It is important to take into account that the size of the diverticulum does not correlate with the symptoms.[5,9] Other symptoms that may be part of the spectrum of the disease are halitosis, heartburn, chest pain and, in severe cases, weight loss.[13]

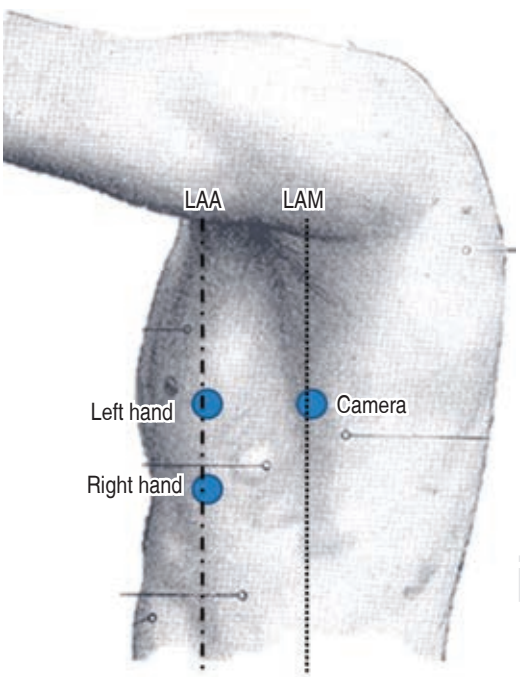

Figure 3: *Trocar placement sites: three 12 mm ports, one located in the fifth intercostal space, middle axillary line (MAL, LAM), and two in the fifth and eighth intercostal spaces above the anterior axillary line (AAL, LAA).*

The clinical diagnosis is complemented by cabinet studies to corroborate it. One of the first performed is the esophagogram, which presents adequate sensitivity and specificity.[13,14] With it, the location, size, and distance of the esophagogastric junction are defined. Usually, the size of the esophageal diverticula varies from 1 to 14 cm, with an average of 4-7 cm.[15]

Most patients are elder adults in the sixth decade of life, and since dysphagia is a common symptom, upper endoscopy is necessary to rule out a neoplastic process, in addition to peptic ulcers, hiatal hernias, and Barrett's esophagus. The diagnosis can be complemented with esophageal manometry.[5,16,17]

Likewise, CT scan is essential to study this pathology in-depth, since it allows us to estimate the size of the diverticular pocket, analyze its relationships with neighboring structures and rule out associated pathologies; it should be carried out, whenever possible, with double contrast.[2]

In our patient, the symptoms produced by the size of the diverticulum and the diagnostic complementation with high endoscopy and computerized axial tomography allowed a quick diagnosis. In addition, manometry was able to corroborate an esophageal motor disorder that also guided us to determine the therapeutic strategy in a more effective way.

Surgical treatment is indicated in the patient with severe symptoms. In our patient, surgical management was decided due to the respiratory symptoms that she presented, to avoid more serious complications.[18] Histological changes in the myenteric plexus of the esophagus have been reported in 80% of the patients studied, although not always related to an esophageal motor disorder. Therefore, there are still

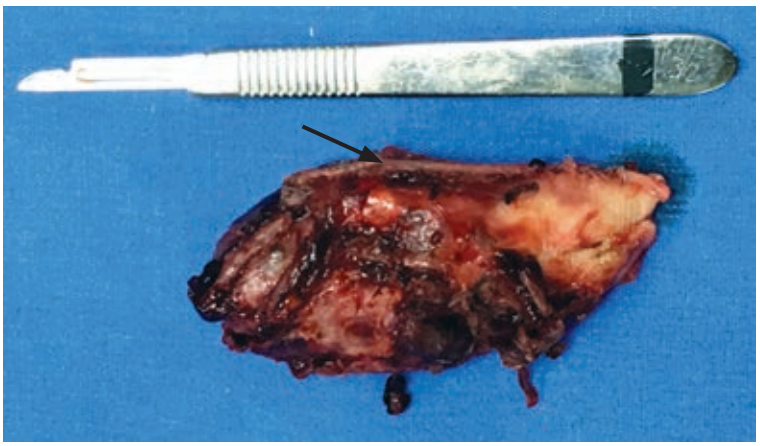

Figure 4: *Resected epiphrenic esophageal diverticulum; a staple line is visible (arrow) and the relationship, in terms of size, with a scalpel handle.*

multiple controversies regarding indications for surgery, the type of treatment and the optimal approach for the treatment of epiphrenic diverticulum.[19]

Before the advent of minimally invasive surgery, the conventional approach was through a left or right thoracotomy, depending on the location of the diverticulum;[18] however, the high postoperative mortality (0 to 11%) and morbidity (33-45%) associated with the transthoracic approach forced the search for other therapeutic options,[20] which left this approach only for selected cases.[21] Multiple authors have published their experiences with minimally invasive, single-port procedures, and recently, even robotic surgery.[9,22]

Currently, the recommended surgical technique is a diverticulectomy with an esophageal myotomy, with or without fundoplication.[4,5,9] Diverticulectomy is necessary to eliminate the risk of rupture, relieve compression symptoms and avoid food stasis, which in the long run term can produce a malignancy. Myotomy is necessary for the treatment of dysphagia caused by esophageal dysmotility, and to reduce intraluminal pressure.[23] The length of the myotomy is still debated among those who report that a selective myotomy is more than enough, against those who favor a long myotomy whick includes the LES and extends to the gastric cardia.[9] The indication for a fundoplication as a routine is not yet clear.

The most frequently used approach is a minimally invasive approach, such as conventional thoracoscopy or video-assisted thoracoscopic surgery (VATS).[3,10,21,24] The advantage VATS offers compared to laparoscopy is a better vision of the area to be operated, which facilitates the dissection of the diverticulum despite the inflammation. Also, it makes the proximal extension of the esophageal myotomy easier and, if necessary, a thoracotomy can be performed.[21,25]

One of the controversies that have become important in the surgical treatment of epiphrenic diverticula is whether or not to perform a myotomy, with or without fundoplication.[12] As already mentioned, the presence of an esophageal diverticulum is mostly associated with some esophageal motor disorder, but this is not always the case, which is why various hospitals have opted for a selective management where myotomy with fundoplication is reserved only for patients in whom some alteration of motility is demonstrated preoperatively,[21,25] the performance of myotomy is debatable in those cases with hypotonic motility patterns of the esophageal body and lower esophageal sphincter by manometry.[26] In this case, the patient presented with a motor disorder before surgery, so the surgical treatment performed was only a diverticulectomy without myotomy, but with an esophageal prosthesis to decrease

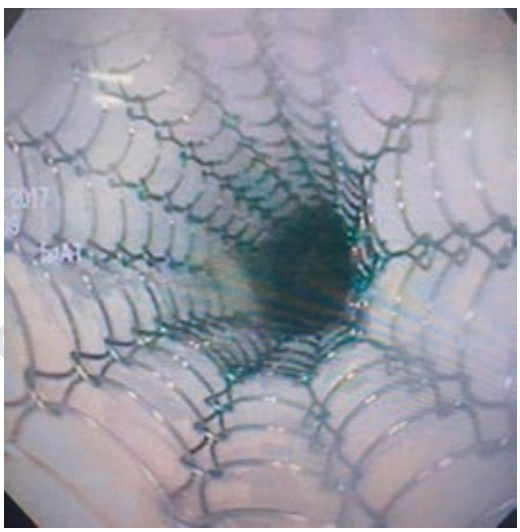

Figure 5: *Placement of the esophageal stent.*

the risk of dehiscence. A diverticulectomy without myotomy is associated with increased recurrence (10-24%) or leakage (9%).[9,17,26]

One of the most feared complications associated with the minimally invasive treatment of the esophageal diverticulum is leakage of the suture line. This complication has a frequency of between 6 and 23% depending on the literature[9,20,27] and generally requires significant action, either through a transthoracic drainage catheter, parenteral nutrition and/or esophageal stent placement. Those used provide closure of the leak site, allowing to start feeding and reducing morbidity.[27]

Despite the minimally invasive approaches, the overall mortality of the surgical treatment of the epiphrenic diverticulum is still almost 5%, and morbidity has been reported in up to 20%.[26] Each case must always be individualized to offer the best treatment, especially in patients with a high risk of complications. There are endoscopic options such as pneumatic dilatation of the cardia in highrisk patients; a feasible treatment, although with a risk of perforation and unsatisfactory results. Peroral endoscopic myotomy (POEM) is an option for the treatment of achalasia, if this is the etiology of the diverticulum. However, a case of epiphrenic diverticulum formation has been reported after performing POEM.[28] Another alternative is the formation of a fistulous path between the epiphrenic diverticulum and the stomach, creating a shunt of the esophagogastric junction.[29] Aiolfi published a case in which only a self-expanding metal stent was placed as symptomatic treatment to a patient in the ninth decade of life with high surgical risk, who did not accept surgery.[30]

CONCLUSION

Minimally invasive thoracic treatment with diverticulectomy and placement of a prophylactic esophageal prosthesis of the esophageal diverticulum is a feasible option for this pathology.[31] This approach may offer lower associated morbidity in high-risk patients. Possible complications of surgical treatment should always be taken into account, and its management will depend on the patient's clinical condition and the available resources of the hospital center.

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