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Zenker's Diverticulum in A Female Patient, Surgical Treatment: Case Report

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ABSTRACT

Zenker's diverticulum is a herniation of the esophageal mucosa and submucosa through Killian's triangle, classified as a false diverticulum. Its etiology is associated with dysfunction of the upper esophageal sphincter, leading to progressive dysphagia, regurgitation, and a risk of aspiration pneumonia. Diagnosis is made through a barium esophagogram, and treatment varies between endoscopic and surgical approaches, depending on the diverticulum's size and symptoms. We present the case of a 78-year-old female with progressive dysphagia and regurgitation, diagnosed with zenker's diverticulum. She underwent cricopharyngeal myotomy and diverticulopexy via an open approach, with favorable evolution, progressive clinical improvement, and complete symptom resolution at three months postoperatively.

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ABBREVIATIONS: Zenker's diverticulum (DZ).

INTRODUCTION

Zenker's diverticulum (ZD) is a rare condition of the upper digestive tract, characterized by herniation of the mucosa and submucosa through the Killian triangle, an area of anatomical weakness in the posterior wall of the pharynx (1, 2).

It is classified as a pseudodiverticulum due to the absence of a muscular layer in its walls. Its etiology has been related to dysfunction of the upper esophageal sphincter, which generates an increase in intraluminal pressure and favors the formation of the diverticulum (3, 4). DZ was first described by Abraham Ludlow in 1767 during an autopsy and subsequently characterized in detail by the German pathologist Friedrich von Zenker in 1877. Its surgical treatment began in the 19th century with the first successful excision performed by William I. Wheeler in 1886. Since then, the approach has evolved from open techniques to minimally invasive procedures, such as endoscopic stapler diverticulotomy (5, 6, 7).

This pathology occurs most frequently in older adults, with a predominance in men. Symptoms include progressive dysphagia, regurgitation of undigested food, halitosis, and, in advanced cases, secondary aspiration pneumonia. Its diagnosis is based on imaging studies, such as barium esophagogram, which allows the presence and characteristics of the diverticulum to be identified. Endoscopy can be useful in the evaluation of complications, although its use remains debated due to the risk of perforation (8, 9, 10).

There are several classifications of DZ. The Morton and Bartney classification divides it into small (<2 cm), medium (2-4 cm) and large (>4 cm). Additionally, the Lahey classification groups diverticula into three types according to their extension and location (11, 12).

The treatment of DZ depends on the size of the diverticulum and the severity of symptoms. Options include open surgical approaches and minimally invasive endoscopic techniques, such as stapled diverticulotomy or cricopharyngeal myotomy. Although endoscopic procedures have demonstrated faster recovery, they present a higher risk of symptomatic recurrence compared to open surgery (9, 13, 14, 15).

This article presents the case of a 78-year-old patient with Zenker's diverticulum classified as Lahey type 2 and Morton type 2 (2 x 1 cm), managed by cricopharyngeal myotomy and open approach diverticulopexy, with favorable postoperative evolution. The clinical, diagnostic and therapeutic aspects of the case are analyzed, contrasting them with current literature.

CASE DESCRIPTION

78-year-old female patient with a 15-year history of systemic arterial hypertension, 15-year history of type 2 diabetes mellitus and 10-year history of dyslipidemia. With a surgical history of total prosthesis of both knees and laparoscopic cholecystectomy more than 20 years ago. She denies drug addiction, allergies or any other relevant history. The patient began to suffer 1 year and 6 months ago with dysphagia to liquids, which was progressive to solids. Two months ago, productive cough with food content was added to the clinical picture after eating, halitosis and dissatisfaction at the end of the meal. For this reason, he went to his primary care physician, who ordered an esophagogram with findings suggestive of esophageal diverticulum, being referred to a third level hospital due to continued symptoms described.

On physical examination, he was conscious, oriented, with good color and hydration of skin and mucous membranes, normolinear chest, with the presence of amplexation and amplexation movements, generalized vesicular murmur, without aggregates. Rhythmic heart sounds of adequate tone and intensity. Abdomen globose at the expense of the panniculo-adipose tissue, soft, depressible, not painful to palpation, with no signs of peritoneal irritation. Extremities intact, without edema, capillary filling of 2 seconds, rest without alterations. Laboratory tests were requested, finding cholesterol abnormalities at 213 mg/dl, with the rest having normal values.

Esophagogram describes the presence of Zenker's diverticulum, suggesting the presence of presbyophagus, with no evidence of hiatal hernia or gastroesophageal reflux at the time of the study (Figure 1).

Figure 1. Esophagogram, lateral and posteroanterior view, radiopaque image suggestive of DZ.

Based on clinical and imaging findings compatible with a diagnosis of DZ, a complete surgical protocol is performed. A cricopharyngeal myotomy + diverticulopexy is performed. Under balanced general anesthesia and supine position, the neck is positioned in hyperextension and deviation to the right, asepsis and antiasepsis, placement of sterile fields, starting with infiltration with local anesthetic. A 5 cm incision is made on the anterior border of the sternocleidomastoid muscle, dissecting in planes up to the platysma muscle, which is incised, continuing with dissection and sectioning the omohyoid muscle with advanced energy to subsequently dissect the internal jugular vein and carotid artery, to displace them laterally. The dissection and section of the middle thyroid vein and inferior thyroid artery with advanced energy is continued, locating Zenker's diverticulum in Killian's triangle, approaching the tracheoesophageal groove, continuing with circumferential dissection of the pedicle with blunt and bipolar dissection, then a 4 cm cricopharyngeal myotomy is performed with monopolar energy, achieving release of the diverticulum. Continuing with diverticulopexy to the prevertebral fascia, in a plane superior to the origin of the diverticulum. Complete textile count, facing by planes and platysma, continuous surge and skin with subdermal (Figure 2).

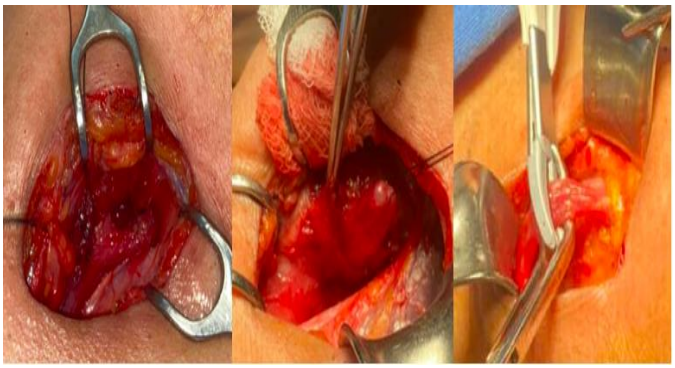

Figure 2. 4 cm cricopharyngeal myotomy, with identification, reference and resection of DZ Lahey 2 of 2 x 1 cm, Morton 2.

In his post-surgical evolution he was reported to be in good general condition, presence of singult and mild pain at the surgical site when swallowing, denying dysphagia, dysphonia or any other symptoms. Afebrile, tolerating diet, spontaneous uresis, walking.

A directed physical examination shows a neck with the presence of a scar on the left hemi-neck of 10 cm longitudinal, approached with a subdermal suture, with no signs of dehiscence or active bleeding, cylindrical neck, central trachea, without palpation of tumor or adenomegaly (Figure 3).

Figure 3. Post-surgical wound approached with a subdermal suture.

Since the patient's postoperative evolution was favorable without complications, it was decided to discharge him from the hospital with subsequent outpatient appointments.

In his first week postoperatively, the patient was seen in the outpatient clinic, the wound had healed properly, so stitches were removed, and he had a score of 4 points on the Eckart scale (dysphagia 2 points, regurgitation 1 point, retrosternal pain 0 points, weight loss 1 point) (Figure 4).

Figure 4. Postoperative wound with adequate healing.

A control esophagogram was requested, with no evidence of Zenker's diverticulum and no water-soluble contrast leak (Figure 5).

Figure 5. Esophagogram with no evidence of Zenker's diverticulum, no water-soluble contrast medium leak was observed.

The Eckardt scale was performed again, with a decrease in symptoms, 2 points, at the expense of regurgitation and weight loss, 1 point. Three months after surgery, with an Eckardt score of 1 point at the expense of regurgitation.

DISCUSSION

Zenker's diverticulum was first described in 1769 by Ludlow, however, it owes its name to the German pathologist Friedrich Von Zenker in 1877. It is considered a pulsion diverticulum, due to the pathophysiology that entails its formation; It is also considered a false diverticulum, so called because its walls lack muscle, since it is only formed by mucosa and submucosa. The location of the diverticulum was first described by Gustav Killian in 1907 (4).

It is located at the upper posterior level of the esophagus, in an area known as Killian's triangle, between the oblique fibers of the inferior pharyngeal constrictor muscle and the transverse fibers of the cricopharyngeal muscle. Killian's triangle corresponds to the area of maximum weakness through which most pharyngoesophageal diverticula protrude. (1, 2, 6, 8).

It is considered the most common esophageal diverticulum (60-65%). This condition occurs very rarely, with an estimated prevalence of 0.01% to 0.11%, with a higher incidence in males than in females (60% vs 34%), and with a peak age of presentation between the seventh and ninth decades of life (50%). (7, 9, 10).

The etiology of Zenker's diverticulum is not completely understood, but most hypotheses lean toward an abnormal structure and physiology of the cricopharyngeal muscle during swallowing, causing uncoordinated pharyngeal contractions and dysfunction of the upper esophageal sphincter. The increase in intraluminal pressure of the hypopharynx during swallowing combined with incomplete relaxation of the cricopharyngeal muscle and inadequate opening of the upper esophageal sphincter result in luminal pressurization that forces the mucosa and submucosa into the posterior hernia. (1, 3, 6, 9).

There are multiple theories, among which the presence of gastroesophageal reflux stands out, which leads to the presence of structural changes in the muscles, where fibrous degeneration and fibroadipose tissue were found. Concluding that these changes compromise the elasticity and opening of the esophageal sphincter, causing an increase in intrapharyngeal pressure due to swallowing due to incomplete muscle relaxation resulting from localized sclerosis. However, some patients with cricopharyngeal hypertonia never develop Zenker's diverticula (11, 13).

In this context, it was hypothesized that acid-induced longitudinal esophageal shortening may be an important cofactor. The absence of an anchoring raphe allows the cricopharyngeal muscle to move away from the constrictors above it as the esophagus experiences shortening of the longitudinal axis. Therefore, the appearance of a space between these structures allows for easy hernia in a hypopharynx with high pressure caudal to the constrictors but cephalad to the cricopharyngeal muscle, presenting a greater area of weakness which would increase the probability of the presence of a diverticulum (3, 4, 5, 6, 9).

Most patients are asymptomatic. Symptoms may be present for weeks or years before a diagnosis is made. The most common clinical manifestations are dysphagia, which is progressive and associated with the presence of regurgitation. Other symptoms that may occur are cough, halitosis, globus sensation and weight loss. In addition, gurgling has been reported in some cases in patients with Zenker's diverticulum when swallowing food (Boyce's sign) or regurgitation of food may occur due to external compression of the pouch by pressing on the left side of the neck near the cricoid cartilage (Quinn's sign) (6, 7, 10). Among the complications presented, the most frequent is aspiration pneumonitis (30%), followed by ulceration, perforation, bleeding, tracheoesophageal

fistulas, vocal cord paralysis, as well as the risk of progression to develop a neoplasia, the most common being squamous cell carcinoma (0.4-1.5%), most frequently located in the lower part of the diverticular pouch. This complication is rare, described for the first time by Schlesinger (cited by Halstead in 1903). Predisposing factors include diverticula with a long evolution (more than 11 years), as well as chronic irritation due to the presence of retained food, as well as trauma during emptying. In many cases, the diagnosis is incidental during surgery or after the anatomopathological study of the piece (7, 13).

The most important and preferred diagnostic method for Zenker's diverticulum is the barium esophagogram with lateral projection and vision of the hypopharyngeal area to diagnose this pathology. In this method, a typical dilation or widening of the posterior surface of the esophagus is evident at the level of the sternoclavicular joint and its size and position can be assessed. However, small diverticula can be overlooked during the radiographic examination due to the superposition of images, so continuous dynamic fluoroscopy is the imaging study that allows control of the swallowing mechanism and identification of a small diverticulum (1, 6, 9).

Esophageal manometry, pHmetry and endoscopy are complementary for diagnosis, the first two can demonstrate if a diverticulum is accompanied by an abnormal response of the cricopharyngeal muscle to swallowing, and the degree of gastroesophageal reflux. The last one by the possibility of structural changes in the mucosa of the diverticulum and visualization of the direction of the diverticulum, thus helping us to exclude some structural pathology of the esophagus or oncology (4, 9).

Several classification systems have been proposed based on size and morphology, including the Brombart system (I longitudinal axis 2-3mm with a rose thorn shape, II axis 7-8mm with a stick shape, III axis in caudal direction less than 1 cm, IV compression of the esophagus), Morton/Bartley (I less than 2cm, II 2 to 4 cm, III greater than 4 cm) and Lahey, which also divides into 3 types depending on size (7).

Treatment is indicated for symptomatic Zenker's diverticulum, regardless of the size of the diverticulum. Currently, the surgical mainstay is the performance of cricopharyngeal muscle myotomy, as the main objective in all surgical modalities, thus eliminating the septum between the diverticulum and the upper esophagus, thus relieving the dysfunctional condition, eliminating the food and secretion reservoir sac. There are 2 approaches: open and endoscopic; and currently we have available as options for the treatment of Zenker's diverticulum: open surgery (diverticulectomy or diverticulopexy with cricopharyngeal muscle myotomy) and endoscopy, in its rigid (i.e., endoscopic stapling or CO2 laser treatment) and flexible modalities. And in recent years, Z-POEM therapy has given satisfactory and promising results (1, 4, 6, 9, 10). The decision on the therapeutic approach depends on the size of the diverticulum and the clinical manifestation. Zenker's diverticula that are discovered incidentally, regardless of size if asymptomatic, are usually treated conservatively until symptoms appear or the diverticulum enlarges. Surgical treatment should be directed at symptomatic patients with or without associated complications with the goal of relieving symptoms and improving quality of life (2, 3, 6).

The standard treatment is diverticulectomy plus cricopharyngeal muscle myotomy. Regarding diverticulopexy versus diverticulectomy, the former is used in patients with diverticula of 1 to 4 cm, and the latter is performed in diverticula >4 cm, having a mortality rate of 2.5% and a complication rate of 11%, with a success rate of 90% to 95% of patients. Indications for an open approach include primary therapy or secondary therapy in case the endoscopic approach fails (16% to 68% of cases). They are also a therapeutic option in young patients who desire a long-lasting resolution of symptoms given the higher success rate and lower probability of recurrence (3, 4, 6).

Despite the good results found, today the open surgical approach is no longer the gold standard. With the evolution of endoscopic techniques, as well as a better understanding of the underlying pathophysiology, Zenker's diverticulum is mainly treated with flexible or rigid transoral endoscopic techniques due to their cost-effectiveness and lower risk of adverse events compared to the conventional open approach. In fact, the endoscopic approach has demonstrated its superiority in terms of shorter operating time, shorter length of hospital stay, and faster resumption of oral intake. However, such techniques often have higher rates of symptomatic recurrence and require additional interventions, as well as present multiple drawbacks in their performance such as the need for neck hyperextension, which in the most common age of presentation of patients is difficult to perform. In addition, inadequate jaw opening and protrusion of the upper teeth can make insertion of the rigid diverticuloscope difficult. These cumbersome conditions can lead to an increased risk of adverse events and recurrence in 36% (3, 8, 9, 11). The importance of this is to determine the choice of patients who could have better benefits from endoscopic treatment, since it is indicated in patients with diverticula between 2 and 6 cm in diameter (in some series 3-5 cm). Outside these ranges it is contraindicated since diverticula smaller than 2-3 cm are not recommended for this treatment because the section line is too short to allow the division of the fibers of the upper esophageal sphincter and diverticula larger than 6 cm represent a contraindication to endoscopic treatment, since the residual pharyngeal cavity can be very long, which does not allow its emptying. Therefore, diverticula shorter than 3 cm should be considered a formal contraindication for the transoral approach. Intraoperative failure of 7.7%, complications of 9.9% and recurrence of 12% have been reported (3, 4, 8, 9, 11).

To overcome the drawbacks of the above-mentioned endoscopic modalities and reduce recurrence, a submucosal

tunneling technique similar to that used in peroral endoscopic myotomy (POEM) for achalasia has been described. It is called Z-POEM (POEM for Zenker's diverticulum) or STESD (endoscopic septum division by submucosal tunneling). Described by Brieau in 2017 as an alternative to decrease recurrence in the endoscopic treatment of Zenker's diverticulum. This submucosal tunneling technique allows for complete exposure and visualization of the septum, which is selectively divided, preserving the overlying mucosa. Advantages of this approach include deeper resolution of symptoms and a lower recurrence rate due to a more precise transection of the septum. A lower leak rate has also been described, as the mucosal entry site is closed with endoscopic clips (3, 12).

CONCLUSION

Zenker's diverticulum is a very rare pathology, present mostly in elderly people, with multiple comorbidities that overshadow the evolution of the pathology and the postoperative period. It should be noted that the data reflected previously are in symptomatic patients, so the number of asymptomatic patients with Zenker's diverticulum is unknown.

In our case we were faced with a patient in her eighth decade of life who was diagnosed due to the presence of clinical symptoms characteristic of Zenker's diverticulum and the diagnosis was confirmed by a barium study. She underwent surgery performing a myotomy of the cricopharyngeal muscle plus diverticulopexy, considered according to the literature the surgical technique to be performed in diverticula of 1 to 4 cm, using an open approach. Because the diverticulum found was approximately 2x1cm, the size is a direct contraindication to the use of endoscopic treatment, as higher recurrence rates have been observed in diverticula <3cm.

Although there is no direct comparison between open and endoscopic management of diverticula, both techniques offer advantages depending on the circumstances surrounding the patient's disease.

Surgical treatment has evolved from open techniques to the introduction of endoscopic management, initially with rigid and later flexible equipment, with the purpose of decreasing intraluminal pressure and recurrences, based on the same principle of sectioning the septum by completely dividing the cricopharyngeal muscle, to create a common cavity and restore normal passage of food.

We conclude that endoscopic treatment was superior in terms of shorter procedure times and lengths of hospital stay, earlier resumption of oral diet, and lower complication rates. However, this modality has several limitations, including hyperextension of the neck in elderly people, the need for general anesthesia, significant rates of intraoperative failure (5-10%), small diverticular size (< 3 cm), inadequate jaw opening and restricted neck mobility are the main causes of technical failure. However, a higher recurrence rate has been observed compared to the open technique. Therefore, the type of surgical modality to be used must be meticulously selected according to the circumstances regarding age, comorbidities, patient limitations, as well as the most important point, which is the diverticular size.

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