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ORIGINAL ARTICLE

Z-POEM: Ideal procedure for the treatment of Zenker's diverticulum?

Z-POEM: ¿Procedimiento ideal para el tratamiento del divertículo de Zenker?

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Abstract

Introduction. Zenker's diverticulum is a rare pathology characterized by the presence of dysphagia, halitosis, cough, and weight loss, which affect the quality of life of patients. The treatment is surgical and the techniques have evolved permanently. The objective of this study was to evaluate the improvement of dysphagia in patients who underwent peroral endoscopic myotomy technique (Z-POEM).

Methods. Descriptive study of a series of 23 patients with Zenker's diverticulum diagnosed by endoscopy and esophagram, treated between May 2018 and November 2021 at different institutions in Bogotá, Colombia, by means of an endoscopic cricopharyngeal myotomy with the Z-POEM technique.

Results. Most of patients were older males. The most frequent symptoms corresponded to dysphagia and regurgitation. The average size of the diverticulum was three centimeters. The hospital stay was one day. One patient presented postoperative dysphagia related to the clips and another presented a mediastinal abscess, which was resolved endoscopically. Currently, all patients are asymptomatic and have not presented recurrence.

Conclusions. Minimally invasive endoscopic treatment by peroral endoscopic myotomy (Z-POEM) in patients with Zenker's diverticulum is a safe and effective alternative, with good results and low morbidity.

Keywords: Zenker diverticulum; esophageal diverticulum; upper esophageal sphincter; deglutition disorders; endoscopic surgery; myotomy.

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Resumen

Introducción. El divertículo de Zenker es una patología poco frecuente, caracterizada por la presencia de disfagia, halitosis, tos y pérdida de peso, que afectan la calidad de vida de los pacientes. El tratamiento es quirúrgico y las técnicas han evolucionado de forma permanente. El objetivo de este estudio fue evaluar la mejoría de la disfagia en pacientes a quienes se les realizó la técnica de miotomía endoscópica peroral (Z-POEM).

Métodos. Estudio descriptivo de una serie de 23 pacientes con divertículo de Zenker diagnosticado por endoscopía y esofagograma, tratados entre mayo de 2018 y noviembre de 2021 en diferentes instituciones de la ciudad de Bogotá, D.C., Colombia, mediante una miotomía endoscópica del cricofaríngeo con la técnica de Z-POEM.

Resultados. La mayoría de los pacientes fueron adultos mayores, de sexo masculino. Los síntomas más frecuentes correspondieron a disfagia y regurgitación. El tamaño promedio del divertículo fue de tres centímetros. La estancia hospitalaria fue de un día. Un paciente presentó disfagia postoperatoria en relación con los clips y otro presentó un absceso mediastinal, el cual fue resuelto de manera endoscópica. Actualmente, todos los pacientes se encuentran asintomáticos y no han presentado recurrencia.

Conclusiones. El tratamiento endoscópico mínimamente invasivo mediante la miotomía endoscópica peroral (Z-POEM) en el paciente con divertículo de Zenker es una alternativa segura y eficaz, con buenos resultados y poca morbilidad.

Palabras clave: divertículo de Zenker; divertículo esofágico; esfínter esofágico superior; trastornos de deglución; cirugía endoscópica; miotomía.

Introduction

Zenker's diverticulum is herniation of the posterior wall of the pharynx through Killian's triangle, made up of the inferior constrictor muscle of the pharynx and the cricopharyngeal muscle. It was described by Ludlow in 1769. It occurs in approximately 0.1% of the population and its incidence is higher in men between the seventh and eighth decade of life [1,2]. Its etiology remains unknown, but it is considered to be directly related to increased pressure within the esophagus and the contractility of the cricopharyngeal muscle during swallowing [1,3].

The treatment of this condition is surgical. Open techniques through cervicotomy have a success rate of 80 to 100%, with a morbidity and mortality close to 30%. The endoscopic proposals described since 1917 by Mosher were focused on minimally invasive septotomy, achieving the union of the lumen of the diverticulum and the esophageal lumen, with success rates around 100%; however, early recurrence is close to 30%, possibly due to an incomplete myotomy. These results stimulated the evolution of endoscopic techniques currently used [4,5].

Peroral endoscopic myotomy (POEM) was described in 2010 by Haruhiro Inoue [6], for the treatment of patients with achalasia. It involves the creation of a tunnel through the submucosal space and the subsequent myotomy of the muscle fibers of the esophagus. Using this same principle, the performance of a pyloric myotomy in patients with gastroparesis was described and in 2017 it was proposed by Brieau as an alternative to reduce recurrence in the endoscopic treatment of Zenker's diverticulum [7,8].

The objective of this study was to evaluate the improvement of dysphagia in patients who underwent the peroral endoscopic myotomy technique (Z-POEM) in a clinic in the city of Bogotá, D.C., Colombia.

Methods

Retrospective descriptive study of patients treated between May 2018 and November 2021 for Zenker's diverticulum. Dysphagia severity was assessed using the Dakkak-Bennett scale [9] and upper digestive tract endoscopy and esophagogram were performed to assess the characteristics of the esophageal diverticulum. Treatment was performed

using an endoscopic cricopharyngeal myotomy, known as the Z-POEM technique. All procedures were performed under general anesthesia, in the left lateral decubitus position, and CO_2 insufflation and an ERBE® electrosurgical unit were used for endoscopy.

Initially, an exhaustive washing of the surface of the diverticulum was carried out to remove any retained food debris. Subsequently, the submucosa was injected with a mixture of saline solution, methylene blue, and gentamicin, at the level of the septum of the diverticulum. A transverse incision of approximately 15 mm was made in the mucosa with an endoscopic scalpel. The submucosal space was entered with the aid of a plastic cup at the tip of the gastroscope. The submucosal space on the anterior and posterior wall of the septum was dissected and under direct vision, a myotomy of the cricopharyngeal muscle was performed up to the base of the diverticulum, respecting the posterior oropharyngeal fascia. Finally, selective hemostasis was performed, washing the dissection surface with saline solution and closing the mucosa with metallic clips (Figure 1).

Results

Twenty-three patients were included, 15 men and eight women, with an average age of 69 years. All the patients had dysphagia and regurgitation as predominant symptoms and three of them had weight loss. The average size of the diverticulum was 3 cm (Table 1).

Average procedure time was 44.2 minutes. The average hospitalization time was one day, with the start of the oral route 24 hours postoperatively. One patient presented immediate postoperative dysphagia related to the clips used for mucosal closure, which resolved after removal of some clips. Another patient presented a mediastinal abscess, for which he received antibiotic treatment and endoscopic drainage. No patient required an intensive care unit, there was no massive bleeding, and there were no deaths associated with the intervention (Table 2).

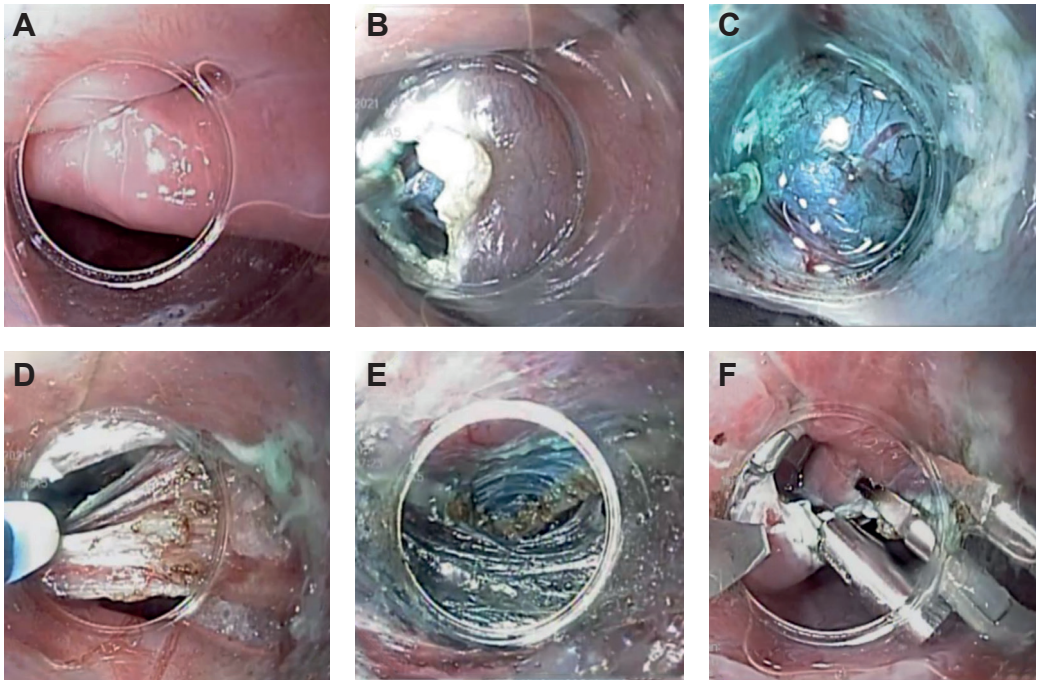


Figure 1. Images of the endoscopic procedure. A, septum of the diverticulum. B, mucosal incision. C, dissection of the submucosal space. D, section of muscle fibers from the septum. E, myotomy. F, closure of the mucosa with clips. Source: Own authors.

Table 1. General characteristics of the patients treated for Zenker's diverticulum (n=23).

Characteristics	n
Sex	
Males	15 (65.2%)
Females	8 (34.7%)
Age, years	
Mean (standard deviation)	69 (20)
Symptoms	
Dysphagia	23 (100%)
Regurgitation	23 (100%)
Weight loss	3 (13%)
History	
Previous diverticulectomy	1 (4.3%)
Diagnostic studies	
Preoperative endoscopy	23 (100%)
Preoperative esophagram	23 (100%)
Postoperative esophagram	19 (82.6%)
Diverticulum size, cm	
Mean (standard deviation)	3 (0.8)

Source: Own authors.

Tabla 2. Resultados postoperatorios de pacientes tratados con Z-POEM

Variable	Result
Technical success	23 (100%)
Clinical success	23 (100%)
Surgical time, mean	44.2 minutos
Complications	2 (8.6%)
Reinterventions	0
Hospital days, mean (standard deviation)	1 (1)
Postoperative antibiotic	1 (4.3%)
Postoperative day for initiation of the oral route, mean (standard deviation)	1 (2)
Asymptomatic at 2 years of follow-up (Dakkak y Bennet scale = 0)	23 (100%)

Source: Own authors.

There was resolution of the symptoms in all the patients, confirming the complete septotomy by esophagram and endoscopy in most of them (Figure 2). There were no cases of recurrence and no patient has required reoperations.

Discussion

The pathophysiology of Zenker's diverticulum is related to an increase in intraluminal pressure, combined with a decreased relaxation of the upper esophageal sphincter at the level of the mucosa and submucosa, which generates its protrusion in an area of localized weakness in Killian's triangle [5-9].

According to the literature, some patients may be completely asymptomatic, but dysphagia is the predominant symptom, occurring in 90% of patients. Halitosis (40%) and less frequently regurgitation, reflux, bronchial aspiration and cough are also found [2,5]. In this study all patients presented dysphagia and regurgitation.

The diagnosis can be made by means of an esophagram, which determines the size of the diverticulum and the diameter of the neck, as well as evaluating regurgitation and aspiration [9]. Computed tomography can be a complementary examination to demonstrate the presence of an air-fluid level or contrast medium on the surface of the diverticulum, but confirmation must be made by upper digestive endoscopy [9].

The complications most frequently related to this clinical condition include aspiration pneumonia, ulcer bleeding, tracheoesophageal fistula, vocal cord paralysis, or squamous cell carcinoma [9].

Surgical treatment has been evolving, from the performance of open techniques to the introduction of endoscopic management, initially with rigid equipment and later flexible, with the purpose of reducing intraluminal pressure and recurrences, based on the same principle of sectioning the septum by means of the complete division of the cricopharyngeal muscle, to create a common cavity and restore the normal passage of food [9,10].

There are multiple surgical techniques proposed for the management of Zenker's diverticulum, without being able to establish an algorithm or specific management guide in symptomatic patients, due to the absence of multicenter studies [3,8]. However, according to a systematic review and meta-analysis,

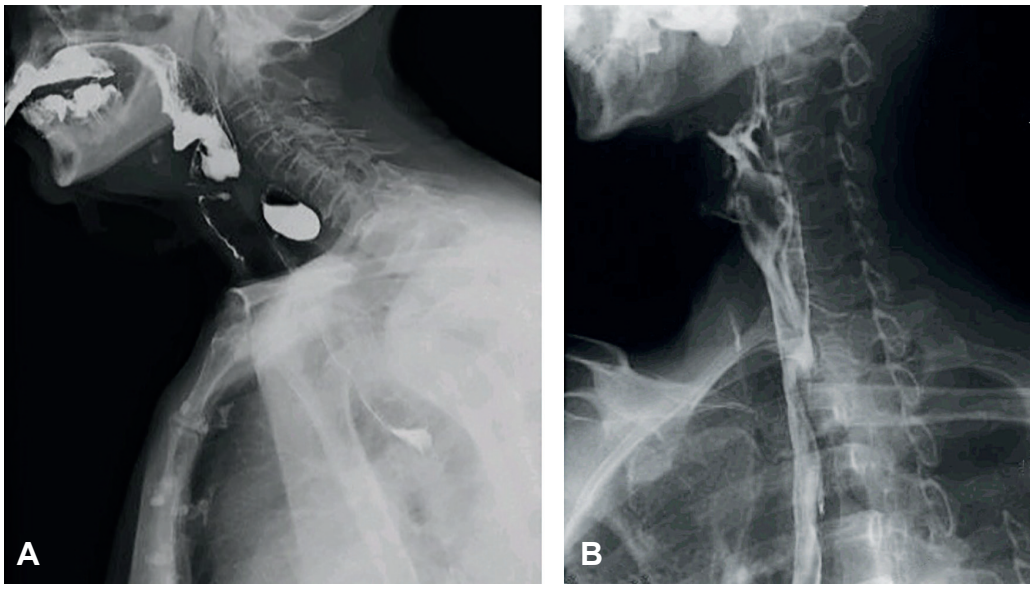


Figure 2. A, preoperative esophagram. B, postoperative esophagram. Source: Own authors.

it is suggested to perform the approach endoscopically due to its easy recovery, shorter hospital stay, and low associated morbidity [3].

With respect to other therapeutic modalities, Z-POEM allows full visualization of the diverticular septum through tunneling in the submucosa, with the same principle of POEM in achalasia [8], which facilitates the performance of a complete cut, decreasing recurrences with respect to conventional diverticulectomy. The extension of the muscle cut one centimeter distal towards the circular esophageal musculature is recommended with the intention of reducing recurrence, and the preservation of the mucosa to reduce the risk of mediastinitis and secondary infections [8]. This was the technique used in our patients.

The risk of perforation is approximately 5%, due to the absence of posterior musculature above the cricopharyngeus, with the possible compromise of the oropharyngeal fascia and its connection with the danger zone. If it occurs, retropharyngeal abscesses and mediastinitis may appear, so dissection must be done carefully on the posterior aspect of the cricopharyngeal septum [11]. No perforations were detected in our series, but one patient presented a mediastinal abscess, very possibly due to leakage through the sectioned mucosa.

The two predictors of endoscopic treatment failure are a septotomy less than or equal to 2.5 cm and the treatment of diverticula equal to or greater than 5 cm due to the persistence of the residual aperistaltic segment [8]. Recurrences are related to inadequate myotomies, scar tissue, hypomotility of the hypopharynx, or regeneration of the septum due to a new coping of the sectioned muscle ends [8].

In the Ishaq meta-analysis [12] a morbidity of 30% was found with open surgery, 3% with rigid endoscopes and 1.5% with flexible instruments, and a success rate of 91% with flexible equipment, with 11%. of recurrences; results comparable to those reported by Peñaloza et al. [5], in which the learning curve of the surgical technique was considered of great importance. As mentioned, there were two complications that occurred in this study: an obstruction of the digestive tract associated with dysphagia, which resolved satisfactorily with the removal of the clips, and a case of mediastinal abscess due to dislodgement of the clips, which was successfully resolved endoscopically.

In Colombia, Gómez-Zuleta [13] presented in 2011 a series of 18 patients with Zenker's diverticulum, nine of whom underwent endoscopic surgery with flexible equipment and a pointed papillotome. In 2016, Peñaloza-Ramírez published a series of six cases managed with conventional septotomy, of which half of the patients required a second procedure [5]. Gómez-Zuleta [14] in 2020 reported 20 cases of patients with Zenker's diverticulum undergoing standard endoscopic myotomy versus myotomy with a diverticulotome, finding benefits in terms of operating time, short hospital stays, and early initiation of the oral route in the second group.

The largest series of Z-POEM cases published internationally is a multicenter study by Yang et al. [4], in which 75 patients successfully treated with peroral endoscopic myotomy are presented, but with a follow-up of no more than three months (Table 3).

Our series has documented the efficacy and safety of peroral endoscopic myotomy (Z-POEM) in the treatment of Zenker's diverticulum in terms of technical and clinical success, short hospital stay, early initiation of the oral route, and without the need for long treatment regimens. antibiotic due to the lack of evidence to support it [3]. All of our patients had complete resolution of symptoms during the two-year follow-up, assessed with the Dakkak and Bennett scale with a score of 0. No cases of recurrence or need for reoperation have been reported to date.

Conclusions

Peroral endoscopic myotomy (Z-POEM) as a treatment for Zenker's diverticulum is a minimally invasive, safe, and effective technique that, in experienced hands, can successfully resolve the symptoms of patients without increasing the risk of complications or morbidity associated with it.

Compliance with ethical standards

Informed consent: This study adheres to the guidelines of Resolution 008430 of 1993 of the Colombian Ministry of Health. During the care process, informed consent was obtained from the patients.

Conflict of interest: none declared by the authors.

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Author's contributions

- Conception and design of the study: Marcela Hoyos-Rincón, Carlos Fernando Fuentes-Díaz, Jesús Antonio Rodríguez-Fajardo.
- Acquisition of data: Marcela Hoyos-Rincón, Carlos Fernando Fuentes-Díaz, Jesús Antonio Rodríguez-Fajardo.
- Data analysis and interpretation: Marcela Hoyos-Rincón, Carlos Fernando Fuentes-Díaz, Jesús Antonio Rodríguez-Fajardo.
- Drafting the manuscript: Marcela Hoyos-Rincón, Carlos Fernando Fuentes-Díaz, Jesús Antonio Rodríguez-Fajardo.
- Critical review: Marcela Hoyos-Rincón, Carlos Fernando Fuentes-Díaz, Jesús Antonio Rodríguez-Fajardo.

Table 3. Experience in management of Zenker's diverticulum.

Author	Year	Number of cases	Complications	Recurrences	Follow up	Technique
Peñaloza [5]	2016	6	0 (0%)	3 (50%)	6 months	Diverticulotomy with flexible endoscope
Gómez-Zuleta [14]	2018	20	2 (10%)	2 (10%)	18 months	Endoscopic myotomy with diverticulotome
Yang [4]	2019	75	5 (6.6%)	1 (1.3%)	24 months	Z-POEM
Hoyos & Rodríguez	2022	23	2 (8.6%)	0 (0%)	24 months	Z-POEM

Source: Own authors.

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