

## Zenker's Diverticle endoscopic treatment or open technique?

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### Abstract

**Introduction:** Zenker's diverticulum is a protrusion of the pharyngeal mucosa through Killian's triangle. It is a rare pathology, but of great importance since it compromises the quality of life of patients who suffer from it. In addition, it can be treated by different methods which have been evolving over the years, but at the moment applying them to each patient, each one has its own advantages and disadvantages, so these should be evaluated with caution, individually according to each case requires it.

**Materials and Methods:** A narrative review was carried out, using databases such as Scielo, PubMed, Science direct, academic google. A search for articles in indexed journals in English and Spanish was carried out from 2010 to 2021.

**Results:** In the management of Zenker's diverticulum there are several methods, endoscopic approach and open technique, currently the endoscopic approach is preferred over the external one. Although the open technique has been more studied and the endoscopic one represents a challenge that requires the expertise of the professional who performs it, surgeons prefer endoscopic techniques since they are minimally invasive and are believed to cause fewer complications. Also, they produce results similar to classic Tran's cervical repair.

**Conclusion:** The open technique is a more definitive and immediate method that relieves symptoms and prevents recurrence. The endoscopy technique is shorter, it avoids recurrence, but the results are highly variable in each patient.

**Keywords:** Zenker's Diverticulum; Diverticulectomy; Diverticulopexy; Myomectomy; Flexible Endoscopy

### 1. Introduction

Zenker's diverticulum is the most common type of esophageal diverticulum. This is located at the postero-superior level of the esophagus. These are protrusions of the pharyngeal mucosa that pass through a relatively weak area of the posterior wall of the pharynx - Killian's triangle. This triangle is located between the inferior constrictor muscle and the cricopharyngeus muscle. Among the most common symptoms are dysphagia, which is the cardinal symptom, regurgitation, weight loss, which can lead to a greater complication, which is Broncho aspiration. Within the pathogenesis it is believed that this pathology is presented by abnormalities in the structure and physiology of the

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cricopharyngeal muscle, an abnormal hypo pharyngeal pressure at the time of swallowing and a lower resistance in the posterior wall of the hypopharynx, which causes muscle dehiscence, producing a herniation between the horizontal and oblique fibers of the cricopharyngeus muscle [1].

**Table 1** Signs and symptoms

Dysphagia, regurgitation, halitosis, Rumbling, neck mass. Weight loss, chronic cough, voice changes. Melena, hematemesis, hemoptysis.
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This pathology is more common in men, and occurs mainly in those over 40 or 60 years old. Previously, management was performed with surgical diverticulotomy, but later, more than 20 years ago, endoscopic management was included. For more than 15 years, a diverticulotome was introduced to facilitate the procedure, but its use has not been widely established in Colombia. Treatment for Zenker's diverticulum should be limited to symptomatic patients. Regarding the treatment, it is carried out in symptomatic patients, which generates a better quality of life in the patient [2].

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## 2. Material and methods

A narrative review was carried out, in which different databases were used such as Scielo, PubMed, and Science direct, academic google. A search of articles was carried out in journals indexed in English and Spanish languages from 2010 to 2021. The keywords used were according to the terms Dec's and MeSH. The following were used: Zenker's diverticulum, diverticulectomy, diverticulopexy, myomectomy, flexible endoscopy. In this review, 28 original and review publications related to the subject under study were identified, of which 17 met the inclusion criteria used. Among the inclusion criteria are: that they were full-text articles, that at the time of the search they allowed the reading of the abstract, that they were related to the subject studied and that they were within the established years. Exclusion criteria: That their publication date was less than 2010 and that they did not allow the reading of the full text.

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## 3. Results

Surgical treatment is the definitive method for ZD. It is performed through two access routes: open (Trans cervical, conventional) and closed (endoscopic, peroral). Open surgery comprises two main techniques: diverticulectomy and diverticulopexy. Although this method is the preferred method, there are differences in relation to the access to be used: open or endoscopic.

Open diverticulectomy is the main technique. The advantages are that it can be used in young patients, with a good life expectancy with a low surgical risk and in cases of anatomical conditions unfavorable for endoscopy. In addition, it eliminates muscle spasm, improving dysphagia, with better long-term results. However, it predisposes to more immediate complications. The indications for surgical treatment are: diverticulitis, dysphagia, regurgitation, perforation and mediastinitis. Aspiration is an absolute surgical indication, even in the absence of esophageal symptoms. Regarding endoscopic treatment, it is an appropriate option for patients with high surgical and anesthetic risk. With the inclusion of endoscopic staplers, peroral treatment took more strength due to its easy handling, shorter surgical time and fewer complications, since the stapler cuts and seals. Endoscopic treatment includes the use of various means: diathermy, CO2 laser through rigid or flexible esophagoscopes and staplers through rigid esophagoscopes, to perform the esophagodiverticulostomy (diverticulostomy or diverticulotomy) [3].

Eduardo Torices Escalante ET. Conducted a retrospective study in which the database of patients with symptomatic Zenker's diverticulum who underwent endoscopic myotomy was reviewed. Fourteen patients were included, six women (43%) and eight men (57%), the mean age was 72.8 years. 18 procedures were performed where 100% had an improvement in the dysphagia score at 30 days. Five patients were followed for at least 12 months and 92.8% had a good evolution. Five diverticula were 3 cm and the rest were 5 cm or more, which underwent endoscopic cricopharyngomyotomy. In all cases the improvement in dysphagia was immediate. In four cases, reoperation was necessary (28.5%), with good results later in 100%, for which they concluded that endoscopic treatment is an effective and safe alternative for the management of patients with Zenker's diverticulum [4].

In another study, 14 cases with a diagnosis of Zenker's diverticulum were taken, 10 treated with the transoral technique and 4 by open surgery. There were three recurrences in the Trans oral technique and one with the open technique. Regarding complications, there was a dental lesion with the Trans oral technique and an esophageal fistula with open

surgery, which was managed with a nasojejun tube placed by endoscopy until its spontaneous closure. Most of them presented oropharyngeal dysphagia due to compression and food regurgitation. In the endoscopy, they noticed that the natural entrance of the endoscope is directly to the diverticulum, so we always suggest to initially request an esophageal-gastroduodenal series, because they can enter the diverticulum without observing the light and perforate it [5].

**Table 2** Zenker Diverticulum Management Techniques

Diverticulectomy with myotomy	Endoscopic diverticulectomy with stapler
<ul style="list-style-type: none"> <li>• It is a definitive procedure and removes the diverticulum.</li> <li>• Tissue is available for histopathological analysis</li> <li>• Relief of symptoms is immediate</li> <li>• Recurrence of symptoms is low</li> <li>• Surgery can take time and patients must be admitted. The initiation of an oral diet is delayed until the suture line has healed.</li> <li>• There is risk of injury to the RLN, esophageal stricture, fistula formation, esophageal perforation, and mediastinitis.</li> </ul>	<ul style="list-style-type: none"> <li>• Surgery short and can be repeated</li> <li>• The hospital stay is short and the oral diet can be started quickly.</li> <li>• Safe and efficient procedure</li> <li>• However, endoscopic surgery may not be possible in all patients and does not remove the diverticulum. There is no tissue for analysis, but recurrences can be treated by a repeat procedure. There is a risk of injury to the RLN, esophageal stricture, fistula formation, esophageal perforation, and mediastinitis.</li> </ul>

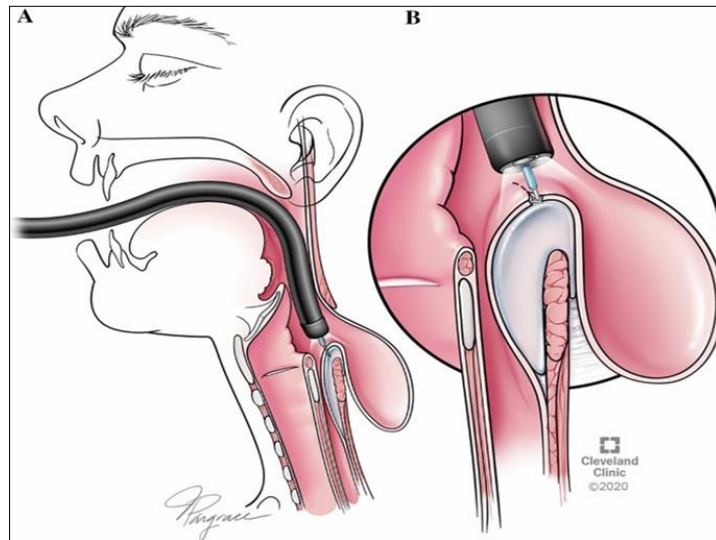
Currently, in the treatment of ZD, the endoscopic approach is preferred over the external one. Although there is a lack of randomized clinical trials, minimally invasive endoscopic techniques are preferred by surgeons because they are believed to cause fewer complications and produce similar results to classical transcervical repair. In a retrospective study carried out, open diverticulectomy was shown to be a procedure of choice in selected patients, the study cohort consisted of 44 patients, the decision to choose open surgical repair depended on the surgical risk, the age of the patient, the size of the septum diverticular and patient preference. Postoperative mortality was nil. The two major complications in the (4.5%) that required surgical intervention were leak and hematoma. The hematoma in a 69-year-old patient was evacuated on the first postoperative day, so it had no further consequences. One patient developed an external pharyngeal fistula that resolved after 10 days with antibiotic treatment and total parenteral nutrition. Another patient (2.3%) had a postoperative hematoma that resolved spontaneously. None had postoperative mediastinitis, neck emphysema, or pneumonia. None experienced dysphagia. In experienced hands, safety could be compared to minimally invasive endoscopic diverticulostomy [6].

In a case report in a 67-year-old male patient, who had been suffering from solid and liquid dysphagia, drowning at night, hypersalivation, halitosis, weight loss and increased appetite. A diverticulectomy with myotomy of the cricopharyngeal muscle was successfully performed. On the third day of surgery, he was able to ingest fluids without any complications, and he was discharged on the sixth day. A year later he had not shown recurrences. In this specific case, the open surgical technique was the most appropriate choice, obtaining good results, which unlike endoscopic procedures, there were no inconveniences due to the lack of infrastructure or the absence of specialized personnel required to perform the endoscopic method [7].

In endoscopic surgery, the CO<sub>2</sub> laser or stapler can be used. Ana Herrera Egeo ET. Analyzed the recurrence or persistence of the diverticulum after the type of surgery performed. Endoscopic surgery was performed with CO<sub>2</sub> laser in 13 patients and with stapler in 6 patients, and an open approach was performed in 3 patients. The operative time, oral intake and admission were shorter in the stapler surgery (52 min, 3 days, 5 days), than in the laser technique (58 min, 5 days, 8 days) and longer in the open approach (107 min, 8 days, 11 days). 68% of the patients improved with the first intervention, a percentage that rose to 95%, taking into account the second intervention in the patients who relapsed after the first surgery. Complications appeared in 13.6% of the patients [8].

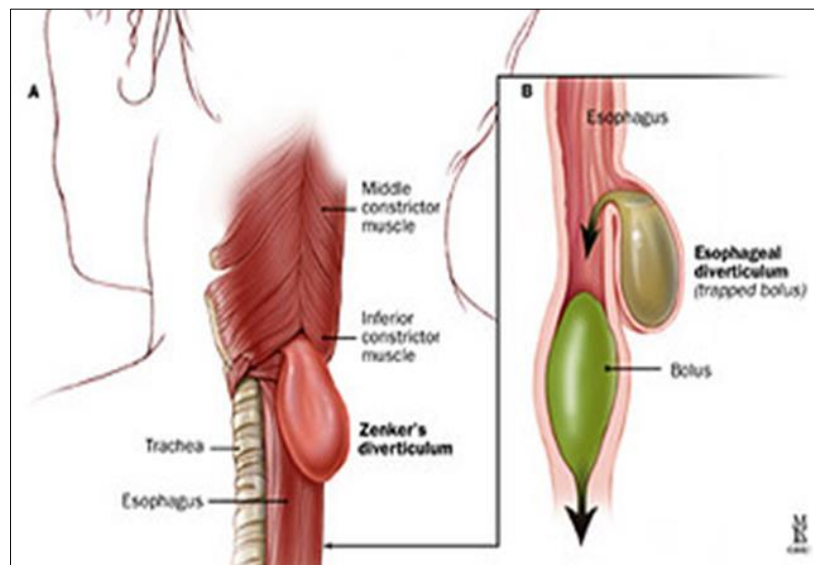
In the study by Rosales Castañeda et. Ten patients were operated with an average age of 64 years ( $\pm 8$ ), seven were men. The main symptoms they presented were regurgitation and dysphagia, which are cardinal symptoms in the pathology studied; present in eight and seven patients, respectively. The treatment used was diverticulectomy with cricopharyngeal myotomy. Complications included intraoperative esophageal perforation affecting 1 patient and esophageal fistula also in 1 patient. Symptoms resolved in 9 patients; the other patient required a new intervention six

months later, with a satisfactory evolution. There were no deaths, so it can be concluded that it is a relatively safe and effective technique [9,10].



**Figure 1** Endoscopic surgery for zenker diverticulum

Unlike the previous study mentioned, in a retrospective analysis, if there were deaths. 64 patients were approached, with flexible endoscopic management, of which 2 died within 10 days after the procedure, however, it is believed for causes not directly related to the intervention. Another patient had a pharyngoesophageal perforation that resolved with conservative treatment after 47 days of admission. A relevant point is that 52 participants showed complete relief of dysphagia at 6 weeks, which is quite significant, despite the fact that 11 of these presented symptomatic recurrence in the medium or long term. These results could be said to be quite variable, although the individual characteristics of each patient must be taken into account. Also, eight were retreated with the same flexible endoscopic method, one using a hybrid endoscopic approach, another using classic open surgery, and another rejecting retreatment. During follow-up, the majority reported absence or minimal controllable dysphagia [11].



**Figure 2** Zenker's diverticulum

Through an endoscopic intervention, the septum is divided between the diverticulum and the esophagus, this allows the unobstructed passage of food and liquids from the diverticulum to the esophagus. The advantages of this technique are many: general anesthesia is not normally required, the intervention can be performed on an outpatient basis or, if necessary, the hospital stay is short and the rate of complications is low. Therefore, it is a suitable option for multimorbid

patients. In approximately 90% of interventions, the symptoms of dysphagia improve after the first treatment, which gives very good effective results in the medium term in most cases. Possible post-procedure complications should not be ignored and foreseen, such as: local pain, leukocytosis, melena, fever, cervical hematoma, among others [12].

The flexible endoscopic method is a rapidly evolving technique for the treatment of Zenker's diverticulum. In a systematic review and meta-analysis of the literature focused on the in-depth evaluation of its efficacy, safety and limitations, twenty studies with a total of 813 patients were taken, and it was determined that it is a feasible, safe and effective treatment for ZD symptomatic, with low rates of adverse events and recurrence. This procedure is minimally invasive; in 31 patients with a previously established diagnosis of ZD based on endoscopic and oral contrast examinations. A soft, flexible diverticuloscope was used to expose the septum and a double knife was used to "cut" the diverticular septum. In the short term, efficacy was shown based on symptomatic relief and the appearance of side effects, and in the long term, from 6 to 12 months later, evaluated by clinical evaluation, upper gastrointestinal endoscopy and passage of oral contrast media. The patients were between 42 and 86 years old; 55% of them were men. Complications were minimal and during the procedure, the mean time was relatively short and recurrence only occurred in 5 patients, requiring a second session of endoscopic treatment to achieve a complete myotome [13].

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#### 4. Conclusion

The open technique confers greater efficiency when it comes to results. In addition, it is the oldest method, which, unlike the endoscopic method, does not require an adequate infrastructure and a professional with experience in this type of procedure. The open technique is a more definitive and immediate method that relieves symptoms and prevents recurrence.

Patients with Zenker's diverticulum have a great impact on their quality of life, so when undergoing a procedure that could improve it, it should be highly considered and studied, focusing on its needs, since that would avoid the probability of exposing the patient to complications or recurrences that require reoperation and cause more discomfort to the patients; leading them to decide to abandon the process.

Endoscopy represents an alternative on equal terms to the rigid endoscopic approach and classical open surgery and can be applied when there is technical impossibility or contraindication for these.

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

The authors declare no conflicts of interest

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