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## **Endoscopic Treatment of Zenker's Diverticulum. A Review of The Literature**

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### **ABSTRACT**

Zenker's diverticulum (ZD) is a sac-like evagination of the mucosa and submucosa through the Killian triangle, an area of muscle weakness between the transverse fibers of the cricopharyngeal muscle and the oblique fibers of the inferior inferior constrictor muscle. The reported prevalence of ZD is between 0.01 and 0.11 percent. The Killian triangle is more frequent in men than in women (60 versus 34 percent). The definitive treatment of symptomatic ZD is surgical. The treatment must be individualized for each case, likewise, the doctor must adopt the one in which he feels most comfortable and as there is more experience in the center in which it is performed, taking into account the technique and the adequate management of complications.

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### **INTRODUCTION**

Zenker's diverticulum (ZD) is a cystic protrusion of the mucosa and submucosa through the triangle of Killian, an area of muscle weakness between the transverse fibers of the cricopharyngeal muscle and the oblique fibers of the inferior constrictor muscle. ZD is defined as a posterior "pseudo" diverticulum with a neck close to the cricopharyngeal muscle. The reported prevalence of ZD is between 0.01% and 0.11%.<sup>1,2</sup>

However, this may be an underestimate as patients with diverticula may be asymptomatic. Symptomatic ZD predominates in men (1:5 ratio) and usually occurs in middle-aged and older adults between 7 and 80 years of age. The incidence of ZD varies geographically, with northern Europe, North America and Australia describing it more often than southern Europe, Japan or Indonesia.<sup>1,2</sup>

ZD arises from a naturally weak area of the hypopharyngeal muscle wall called the triangle of Killian, which consists of the oblique fibers of the hypopharyngeal constrictor and cricopharyngeal muscles. Killian's triangles were more common in men than women (60% vs. 34%), and triangle size correlated with body size and neck length and origin. Various conditions predisposing to internal herniation in the triangle of Killian, such as diseases associated with reduced upper esophageal sphincter function, abnormal esophageal

motility, or esophageal shortening, must be present to develop ZD. The increased intraluminal pressure observed in ZD patients may be secondary to or a consequence of poor bolus passage and gastroesophageal reflux disease. Diverticula can be asymptomatic. Transient oropharyngeal dysphagia may be observed in ZD patients early in the course of the disease. The opening of the large ZD is usually aligned with the pharyngeal axis to allow preferential entry of food into the diverticulum. When the pharynx becomes large enough to accommodate contents such as mucus, pills, sputum, and food, patients may complain of bad breath, gagging, lumps in the throat, or regurgitation of food. Patients with chronic dysphagia may experience significant weight loss and malnutrition. In rare cases, a ZD can become so large that its contents can rise up and completely block the esophagus.<sup>1,2</sup>

Complications of ZD include aspiration pneumonia, ulceration and bleeding from drug retention, fistula formation between diverticula, and paralysis of the tracheal lumen and vocal cords due to pressure from food retention. Diverticular squamous cell carcinoma is a rare complication occurring in 0.3–1.5% of ZD cancers. Risk factors for malignancy include age, male sex, long medical history, and larger diverticulum

size. ZD should be suspected in middle-aged or older adults with progressive dysphagia (often fixed) and regurgitation of undigested food. ZD is diagnosed with a barium swallow test. Upper gastrointestinal endoscopy is not necessary to confirm the diagnosis but is recommended to rule out concurrent malignancies. ZD has an endoscopic appearance with a discrete lumen that may not always be visible if it is small. <sup>1, 2</sup>

### THEORETICAL FRAMEWORK

#### Treatment

Asymptomatic patients with diverticula <1 cm: Do not require treatment. Patients can wait for treatment until symptoms appear.

In symptomatic patients with diverticula > 1 cm:

- Rigid endoscopy: Rigid endoscopy is usually performed under general anesthesia. The Weerd pocket scope is used to identify the common wall between the diverticulum and the esophagus. Different methods can be used to separate the septum between the esophagus and the diverticulum using a variety of cutting and coagulation devices, including a CO<sub>2</sub> laser:

- The stapling technique (endoesophageal stapler [ESED]) is safe and effective in a short time, significantly reducing hospital stay and recovery time compared with other surgical techniques.

DEES may provide better symptomatic relief than other endoscopic techniques, especially in patients with small diverticula. Although it was previously believed that diverticula smaller than 2 cm could not be effectively treated with this method, modifications of the stapler method have been described, some of which allow the application of This method is for smaller diverticula. <sup>3</sup>

- The Dolman technique involves coagulating the septum between the esophagus and the diverticulum with a separate forceps, followed by separation of the coagulated tissue with a dermal knife. • Harmonic scalpel or LigaSure can cut and freeze tissue with minimal heat dissipation. Both can be used with diverging glass and both are particularly suitable for cutting small ZD (>2 cm) partitions. <sup>4</sup>

Dental trauma, perforation, and recurrent laryngeal nerve palsy are a problem with rigid endoscopic techniques.

**Flexible endoscopy.** Soft endoscopic techniques include preparation along the midline of the septum, followed by myomectomy of the pharyngeal muscle fibers between the lumen of the esophagus and the lacrimal sac. The goal is to create a flow path from the DS down the esophagus. Laparoscopic-assisted flaccid diverticulectomy should only be performed by experienced interventional endoscopic surgeons. <sup>5</sup> The procedure is usually performed under deep anaesthesia under controlled anaesthesia or under general anaesthesia to protect the airways. High-resolution video endoscopes are preferred, although this procedure can be performed with older fiberoptic endoscopes. Carbon dioxide (CO<sub>2</sub>) should be used for degassing. Proper endoscopic exposure of the ZD septum is essential. Usually, this is

achieved by inserting a gastrointestinal tube (CH 14-18) or a rigid tube that remains in the lumen of the esophagus during surgery. The gastric tube also protects the opposite wall of the esophagus from thermal injury when the ZD septum is made. However, contact of the septum to a gastric tube may not be optimal, especially in the presence of small perforations or diverticula that curve relative to the esophageal lumen. Instead, a rigid guide tube or external plastic tube, developed based on experience in otolaryngology with a rigid pocket bronchoscope, can be used. A transparent beveled cap attached to the endoscope tip can also improve exposure. Using a knife or unipolar forceps, a preliminary incision or incision is made in the upper part of the ZD septum. The transverse fibers of the pharyngeal muscle should be visualized. <sup>5, 6</sup>

Cut/fold right along the center line of the partition. A mixed current (using the Erbe Endocut setting) can be used for pre-cutting and a coagulation current for ablation of muscle fibers. Other endoscopic cutting tools designed for submucosal incision (eg, hook knife, wash knife, hybrid knife) can also be used to cut the septum. The use of argon plasma coagulation for septal separation is obsolete and is used only for hemostasis. To minimize the risk of perforation, the esophageal lumen and diverticulum should always be under direct control, which often becomes easier after the first incision. At the beginning of the learning curve, 2-3 cm should be separated from the septum of ZD, then stopped and repeated treatment after a few weeks. If (microscopic) perforation is suspected, the bottom of the incision can be closed with internal pads. They can also be used to stop bleeding in case of bleeding. <sup>5, 6</sup>

To prevent microperforation, an ancillary technique was used in which two mediators were placed on each side of the ZD septum prior to knife surgery. If there is a large perforation visible during surgery that is difficult to close with forceps, we leave the alimentary canal intact to allow for esophagitis and better visualization in the event of reoperation. Careful treatment with nasogastric tube feeding, antibiotics, and analgesia is usually sufficient to stop the leak. Visual inspection is not very useful. <sup>7</sup> There is insufficient evidence to support antibiotic prophylaxis.

Follow-up radiographic examinations of patients treated with DS endoscopy are not generally indicated for the evaluation of postoperative outcomes because they do not correlate with dysphagia symptoms. After endoscopic treatment, the diverticulum was still visible on radiographs as a residual pouch. The most common symptoms after surgery are pain or discomfort in the throat. If carbon dioxide or air leaks into the mediastinum due to (microscopic) perforation during surgery, the patient may experience chest and/or back pain. In some cases, severe subcutaneous emphysema can cause transient dysphagia, voice changes, and localized neck pain. Symptoms usually go away after a few days. Large perforations in the esophagus are rare. Heavy bleeding is very rare. Other complications were mainly related to sedation, such as peridural myocardial infarction and pulmonary

complications. In a systematic review of 20 studies including 813 patients undergoing flexible endoscopic septal incision, the combined success, adverse events, and recurrence rates were 91.11 and 11%, respectively. Transabdominal

Laparoscopic Surgery: Zenker-Peroral Endoscopic Myotomy (Z-POEM) is a newer flexible laparoscopic technique for the treatment of ZD that is considered the laparoscopic equivalent of myotomy. Z-POEM uses a submucosal tunnel to fully expose and resect the septum. A submucosal tunnel may be particularly suitable for the treatment of small ZDs (<2 cm) because the small sac may disappear after myomectomy. However, large APs (>2 cm) also require a partial mucosal incision to form a common channel between the vesicle and esophageal lumen to ensure proper drainage of the AP. There are no data comparing the effectiveness of POEM with other approaches, nor experience with Z-POEM is not widely available.<sup>8</sup>

Precautions for all patients: Endoscopy or nasogastric tube placement should be performed with caution due to the risk of accidental perforation of the diverticulum. In patients diagnosed with TD, intubation under direct imaging is reasonable. Endoscopes that require blind vision (e.g., lateral view endoscopes used for endoscopic retrograde cholangiopancreatography, ultrasound endoscopes, and transesophageal transducers of the heart) can be moved after initial endoscopy with an anterior endoscope and passing through an external tube or guide wire. The nasogastric tube must be guided through a wire or under direct endoscopic imaging. ZD can prevent the video capsule wireless endoscope from passing. If capsule endoscopy is needed, the capsule can be placed into the duodenum by endoscopy to avoid this problem. Recurrent symptoms may occur if muscle is inadequate or if the edges of the severed muscle have been replaced. Laryngeal dysfunction often persists after treatment and can affect motor function of the larynx and pharynx, also causing dysphagia. The choice of treatment strategy in patients with recurrent symptoms depends on the size of the diverticulum, the patient's operational risk, the need for radical treatment, and the available experience. Flexible endoscopic therapy may be effective in patients with incomplete septum because prolonging the septum is safer after an adhesion has formed between the esophageal wall and the diverticulum. However, for more decisive success, open surgery and endoscopic rigid bronchoscopy may be preferred.

### DISCUSSION

The definitive treatment of symptomatic ZD is surgical.<sup>3-8</sup> the decision to use an open or transoral approach (rigid endoscope or a flexible endoscope) is made by physicians based on the ability to visualize the ZD and septum endoscopically, the patient's body habit, the support of the ZD bag against the back wall, and local experience. Short necks, decreased hyomental distance, and/or a high body mass index are most often associated with difficult exposures

and require an open approach. Diverticula less than 2 cm long are usually treated with endoscopic methods.<sup>8</sup>

Transoral (endoscopic) approaches are less invasive than open surgery and are associated with shorter operating times, hospital stays, faster resumption of oral intake, lower complication rate, and easy access in case of recurrence. However, endoscopic approaches are also associated with higher rates of symptom recurrence.<sup>7,8</sup>

For patients who are poor surgical candidates, the flexible endoscopic approach is the procedure of choice if experience is available. The main advantage of the flexible endoscopic approach is that it can be performed without the need for general anesthesia, which is required for both open surgical approaches and rigid endoscopic approaches. While the two endoscopic techniques have not been compared directly in randomised trials, the evidence suggests that there may be a higher rate of recurrence and the need for revision with flexible compared to the rigid endoscopic technique.<sup>4</sup>

### CONCLUSION

The treatment must be individualized for each case, likewise, the doctor must adopt the one in which he feels most comfortable and as there is more experience in the center in which it is performed, taking into account the technique and the adequate management of complications.

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