Operations for Zenker's Diverticulum

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Zenker's diverticulum is a false diverticulum or pseudodiverticulum of the esophageal mucosa and submucosa occurring at Killian's dehiscence, which lies at the junction between the oblique fibers of the cricopharyngeus muscle and the transverse fibers of the inferior pharyngeal constrictor (Fig. 11.1). The Zenker's diverticulum is a pulsion diverticulum thought to occur as a result of inadequate coordination between these muscle fibers, with a resultant increased pharyngoesophageal intraluminal pressure. The advent of endoscopic techniques has transformed the surgical treatment of Zenker's diverticula. Although the treatment paradigm has shifted to minimally invasive approaches with repair assisted by endoscopic stapling or lasers, traditional transcervical procedures can still play a role in selected cases. This chapter illustrates our tailored approach to patients with Zenker's diverticulum and demonstrates the open surgical and endoscopic techniques.

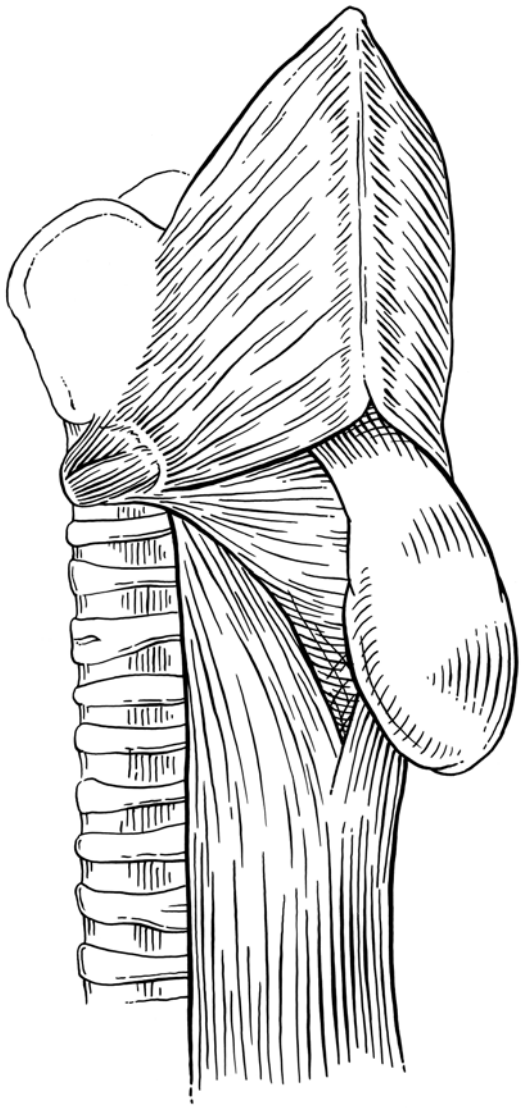

Fig. 11.1 Zenker's diverticulum, at the junction between the oblique fibers of the cricopharyngeus muscle and the transverse fibers of the inferior pharyngeal constrictor

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11.1 Clinical Scenario #1

A 55-year-old woman presented with progressive dysphagia for solids, with a gradual onset 2 years ago. She stated that sometimes she felt as if food got stuck in her neck. She had no odynophagia and no dysphonia, but had nocturnal coughing spells from aspiration of liquid in her trachea. Her husband said that she always has bad breath. A barium swallow showed a 5-cm Zenker's diverticulum. The patient is otherwise healthy.

11.2 Clinical Scenario #2

A 92-year-old man presented with progressive dysphagia for solids, with a gradual onset 2 years ago. He stated that sometimes he felt as if food got stuck in his neck. He had no odynophagia and no dysphonia, but he has been hospitalized numerous times for chronic aspiration. He has terrible breath odor. A barium swallow showed a 5-cm Zenker's diverticulum. The patient has had four-vessel coronary artery bypass grafting. He maintains an ejection fraction of 13 % and is on 3 L of oxygen at rest and 6 L when he walks around his house.

11.3 Workup and Choice of Approach

Barium swallow is the diagnostic study of choice. The barium swallow not only can identify the Zenker's diverticulum (Fig. 11.2), but also can provide more accurate measurements of the distance between the top of the septum and the bottom of the diverticulum than flexible esophagoscopy. Therefore, a barium swallow should be performed in all patients to guide the most appropriate surgical approach.

In patients who also complain of symptoms of gastroesophageal reflux, such as regurgitation and heartburn, we perform esophageal function tests to detect reflux objectively. (During these tests, the catheters are inserted under fluoroscopy to avoid perforation of the diverticulum.) In these patients, we perform a laparoscopic fundoplication prior to addressing the Zenker's diverticulum, in order to stop the reflux and prevent serious episodes of aspiration, which may occur after the transection of the upper esophageal sphincter—the last protective barrier to the gastroesophageal reflux—during the cricopharyngeal myotomy.

The decision to undertake an endoscopic or a transcervical repair depends on the patient's anatomic characteristics, surgical risk, and the size of the diverticulum. Anatomic characteristics can limit the surgical exposure during the endoscopic repair of Zenker's diverticulum. A short neck, a short hyomental distance, and a high body mass index correlate significantly with failure of exposure during an endoscopic repair. Furthermore, maxillary dentition, trismus, and preexisting limited motion range of the cervical spine may adversely influence the surgical exposure of the esophagodiverticular septum (common party wall) with the use of the bulky Weerda diverticuloscope. Most patients with Zenker's diverticulum are in their seventh and eight decades of life and typically have multiple medical comorbidities and a varied degree of surgical risk. Endoscopic repair may be a valid alternative for high-risk patients if there is concern about a longer surgical time during an open surgical approach. Finally, the size of the diverticulum can influence the type of repair. Specifically, a Zenker's diverticulum with a distance between the top of the septum and the bottom of the diverticulum of less than 3 cm may not be amenable to stapled endoscopic repair because the distal end of the endoscopic stapler is 1.5 cm and is nonfunctional. Endoscopic stapling in these cases may result in an incomplete division of the party wall and an incomplete myotomy, but endoscopic laser myotomy is still feasible.

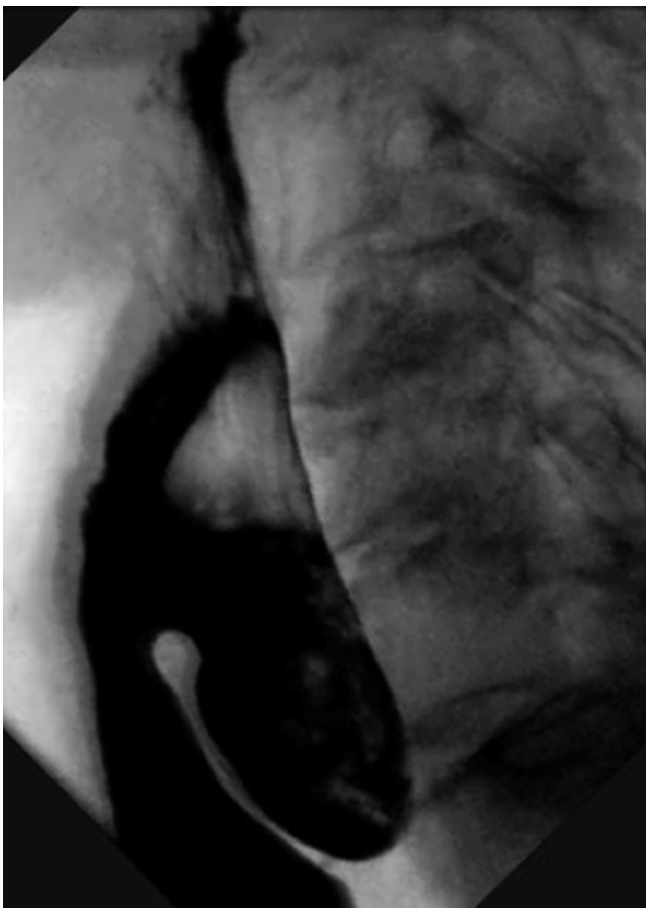

Fig. 11.2 Barium swallow identifying a Zenker's diverticulum

11.4 Operation

11.4.1 Operative Planning

In the operating room, the patient is positioned supine on the table and is placed in a 20° reverse Trendelenburg position. The neck is hyperextended by placing a shoulder roll. This maneuver facilitates the insertion of a rigid esophagoscope when an endoscopic approach is planned. If a transcervical approach is planned, the patient's head is also rotated opposite to the location of the diverticulum to facilitate the surgical exposure of the patient's neck. Preoperative antibiotics are given before instrumentation of the esophagus. Then, with protection of the maxillary alveolus with a dental guard or moist gauze, we perform a rigid or flexible esophagoscopy to confirm the location of the pouch (usually the left side) and to place a wire guide within the esophageal lumen. (We use the guide wire that is supplied with Savary esophageal dilators.) The wire guide facilitates the placement of the diverticuloscope during the endoscopic approach and can be useful to identify the esophagus in the transcervical approach.

When a transcervical approach is planned, we prefer to pass a 36 Fr Savary dilator over the wire to help identify the esophagus during the operation and to ensure that we do not narrow the lumen when resecting the diverticulum. Additionally, we pack the diverticulum with 1/4-inch ribbon gauze, using a laryngeal forceps inserted through the endoscope, to assist in identification of the diverticulum during the operation. The ribbon gauze is kept long, is taped to the patient's cheek, and is removed before the stapling of the diverticulum. If the diverticulum is large enough (>4 cm on the preoperative barium swallow), we use the inflated balloon of a 16 Fr Foley catheter (with its tip cut) to aid in the identification of the diverticulum in the operative field.

11.4.2 Transcervical Approach

The skin incision is made on the neck, along the anterior border of the sternocleidomastoid muscle. Subplatysmal flaps are elevated, followed by lateral retraction of the sternocleidomastoid and medial retraction of the strap muscles. The omohyoid is usually transected to improve the exposure of the surgical field. The middle thyroid vein is ligated, whereas the inferior thyroid artery usually can be preserved. Further dissection is carried out to retract the carotid sheath laterally and access the esophageal diverticulum, which lies anteromedially to the prevertebral fascia. The recurrent laryngeal nerve is found in the tracheoesophageal groove as it enters the cricothyroid muscle and should be identified and preserved. Careful medial retraction of the trachea and the thyroid is performed with the assistant's hands to avoid traction injury to the recurrent laryngeal nerve. The diverticulum is carefully pulled with an Allis clamp, and its neck is dissected off its adhesions from the muscle fibers until the point of herniation of the esophageal submucosa from the muscle fibers is evident. At this point, a cricopharyngeal myotomy, which is started with a right-angle instrument inserted in the extramucosal plane at the inferior neck of the diverticulum, is extended onto the muscularis propria of the cervical esophagus for a few millimeters. The myotomy is always performed, as it is essential in resolving the motor discoordination implicated in the pathophysiology of Zenker's diverticulum. If the diverticulum is small (<2 cm) we perform only a myotomy that also extends 1 or 2 cm cephalad onto the inferior pharyngeal constrictor. Conversely, if the diverticulum is larger than 2 cm, we elect to perform a diverticulectomy with a stapler.

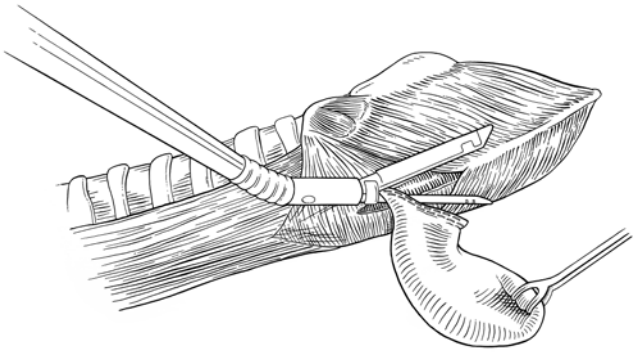

Fig. 11.3 Diverticulectomy with a stapler allows simultaneous resection of the Zenker's diverticulum and closure of its neck

We use the same stapler for both endoscopic and transcervical approach: the Endopath® 35-mm ETS Articulating Linear Cutter (Ethicon, Somerville, NJ). This device (with a blue cartridge) has an articulating head that can be applied close to the neck of the diverticulum in the limited exposure of the transcervical approach, and it is small enough to be used endoscopically to provide an adequate view of the party wall. Performing diverticulectomy with a stapler allows for the simultaneous resection of the diverticulum and closure of its neck (Fig. 11.3). The operation is concluded with a water leak test. A #10 flat Jackson-Pratt suction drain is placed in the operative field and the platysma and the skin are reapproximated and closed.

11.4.3 Endoscopic Approach

We initially perform a rigid cervical esophagoscopy to assess our ability to access the diverticulum and evaluate its precise location and size.

Next, we insert the Weerda diverticuloscope with adequate protection of the maxillary gingiva. The diverticuloscope is positioned with the anterior blade within the esophageal lumen and the posterior blade within the diverticulum (Fig. 11.4). This diverticuloscope can adjust the angle and the distance between the two blades while maintaining a fixed angle. The valves of the diverticuloscope are then widened to isolate the septum for its entire length. We then insert a zero-degree, 5-mm Hopkins® telescope (Karl Storz, Tuttingen, Germany) or a urological endoscope into the oral cavity to confirm adequate positioning. The diverticuloscope is then secured to the bed using a self-retaining instrument, such as the Riecker-Kleinsasser laryngoscope holder.

Once the patient is set up and the septum is isolated, we apply the Endopath® 35-mm ETS Articulating Linear Cutter (Ethicon) with a blue cartridge and orient the stapler cartridge "upside down" so that the longer lip with the cartridge lies within the esophageal lumen while the shorter lip is placed within the diverticulum (Fig. 11.5). This position ensures maximum division of the party wall upon firing of the stapler.

Once the adequate positioning of the stapler is confirmed with the telescope, the stapler is fired and the division of the party wall that includes the cricopharyngeal muscle is accomplished (Figs. 11.6 and 11.7). Two or more applications of the stapler may be necessary, depending on the size of the diverticulum. An internal cricopharyngeal myotomy is performed in this manner.

If the preoperative barium swallow has shown that the diverticular pouch is too small to accommodate a stapler, we have used a CO_2 laser to divide the party wall. The CO_2 laser has hemostatic properties and produces minimal surrounding thermal damage. The setup for this procedure (or to facilitate the positioning of the stapler in difficult cases), is the same as described above. We then place two temporary stay sutures of 2–0 silk through the party wall using an Endo Stitch™ (Covidien, Minneapolis, MN) to allow for lateral retraction while performing the laser diverticulotomy. We use an OPMI® Sensera operating microscope (Carl Zeiss, Jena, Germany) with a CO_2 laser micromanipulator at working distance of 400 mm and at a setting of 5–10 watts.

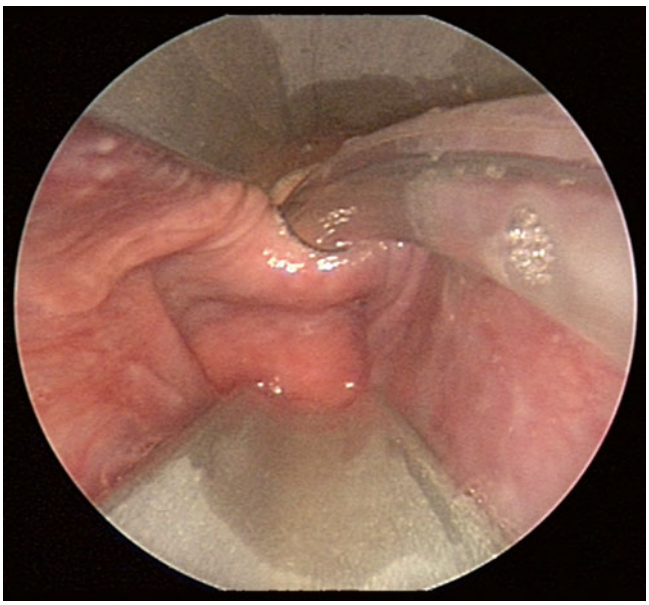

Fig. 11.4 Positioning of the Weerda diverticuloscope in an endoscopic approach to Zenker's diverticulum

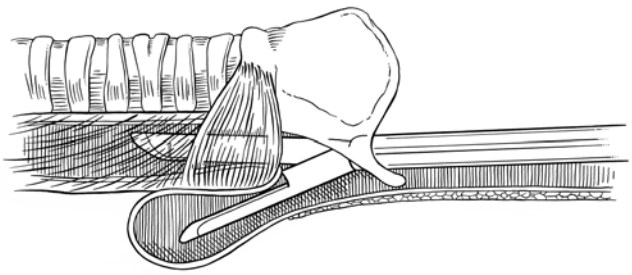

Fig. 11.5 The Endopath® 35 mm ETS Articulating Linear Cutter (Ethicon™) is oriented so that the longer lip with the stapler cartridge lies within the esophageal lumen and the shorter lip is placed within the diverticulum

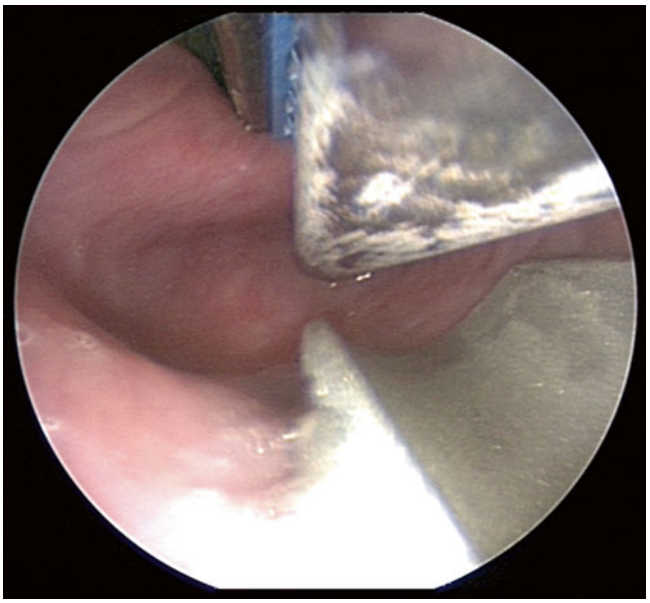

Fig. 11.6 Positioning of the stapler in the endoscopic approach to Zenker's diverticulum

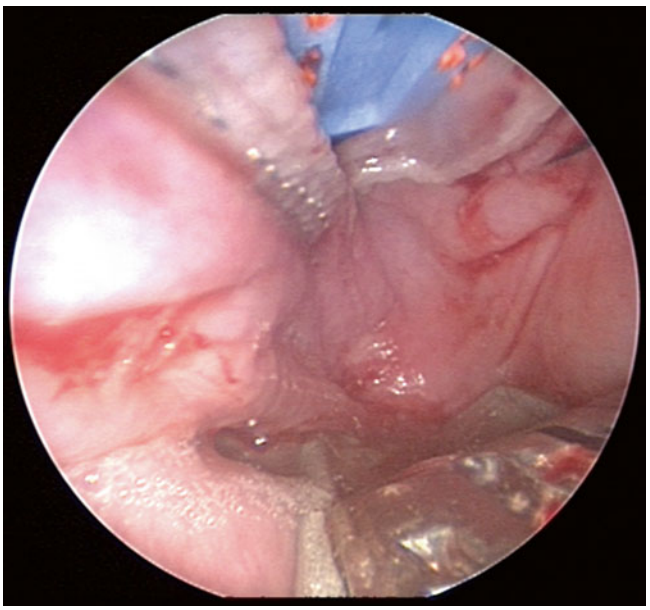

Fig. 11.7 Division of the party wall after firing of the stapler

11.5 Postoperative Care

Patients are admitted overnight and a contrast esophagram with either barium or a water-soluble agent such as Gastrografin is performed the next day to rule out a leak from the staple line. A regular diet is then started. If a drain is present, it is pulled prior to discharge, 24–48 h postoperatively.

Selected Reading

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