



Vocal Fold Paralysis Following Peroral Endoscopic Myotomy for Zenker's Diverticula: A Case Report

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1 | Introduction

Zenker's diverticula (ZD) are uncommon outpouchings of the hypopharynx, occurring between the cricopharyngeus and the inferior pharyngeal constrictor muscles. Patients with ZD typically present with dysphagia, regurgitation, globus, and halitosis. Diagnosis is confirmed with barium swallow study and endoscopy [1]. Open surgical treatment has traditionally been the gold standard for ZD; however, a new endoscopic approach has been gaining traction since its first description in 2016 by Quan-Lin Li [2]. Zenker's peroral endoscopic myotomy (ZPOEM) is a rapidly-evolving, tunnel-assisted flexible endoscopic diverticulectomy used for ZD. The most common reported complications of ZPOEM have included perforations and bleeding [3]. While ZPOEM is considered minimally invasive, its proximity to critical neural structures raises concern for complications such as vocal fold paralysis (VFP), which has not yet been documented in the literature. Here, we describe the first reported case of post-ZPOEM VFP.

2 | Case Report

A 68-year-old male was evaluated by his primary care provider with the chief complaint of food "getting stuck in my neck" and occasional regurgitation of solid food and pills. A barium swallow revealed a 1.7 cm × 1.5 cm posterior proximal esophageal diverticulum consistent with ZD (Figure 1). He was referred to the Mayo Clinic Florida (MCF) Department of

Gastroenterology and Hepatology (GIH) for further evaluation and management.

Following his initial MCF GIH visit, the decision was made to undergo ZPOEM as a definitive initial therapy for treatment of his Zenker's diverticulum, which was completed as follows by an experienced GIH endoscopist. First, a dyed Hetastarch solution was injected into the septum of the diverticulum. Next, using ERBE T-knife on "cut," a mucosal incision was made along the septum. Then, using ERBE T-knife on "Precise Sect" to 3 cm, a submucosal tunnel was extended on both the diverticulum side and septum side. "Cut" was then used to divide the cricopharyngeus (Figure 2). The patient's diverticulum had a narrow neck and a phlebolith was present in the pouch that could not be removed. The patient was observed overnight post-procedurally.

The next day, the patient had new-onset raspy vocal quality. A barium swallow study was performed, which confirmed that there was no leak, and the patient was discharged with a proton-pump-inhibitor for presumed reflux contributing to his raspiness. At scheduled 1-month follow-up, the patient had persistent hoarseness prompting referral to MCF Department of Otolaryngology – Head and Neck Surgery where endoscopic examination revealed left vocal fold immobility and glottic insufficiency (Figure 3).

The patient underwent vocal fold augmentation with autologous abdominal fat and started weekly voice therapy. Repeat

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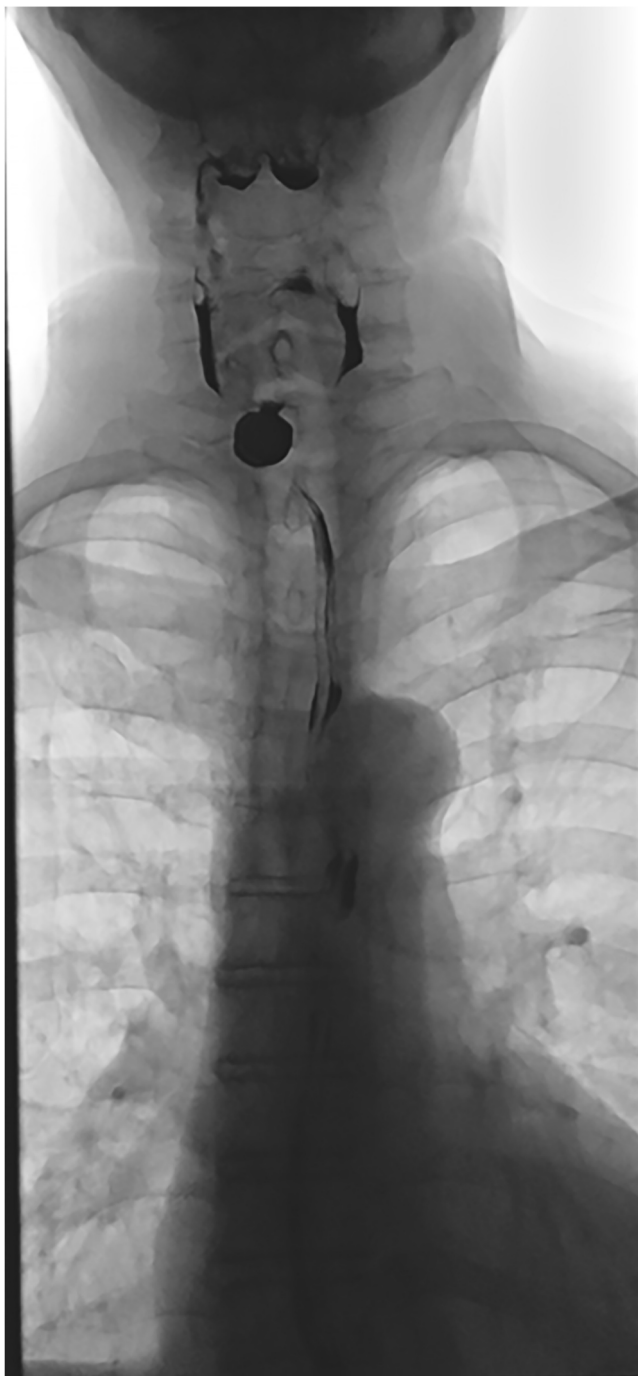


FIGURE 1 | Barium swallow study confirming the presence of a Zenker's diverticulum.

examination showed complete glottic closure with phonation and consistently-improved vocal quality. He was followed at 6-month interval, at which time voice quality continued to be adequate and there was some improved mobility of the left vocal fold.

3 | Discussion

This case represents the first documented instance of VFP following completion of ZPOEM, a complication that underscores

the potential, yet still poorly understood, risks of this emerging procedure.

3.1 | Anatomical Considerations

ZD is an acquired mucosal herniation at a weak area in the esophageal lumen between the transverse fibers of the cricopharyngeus and the oblique fibers of the inferior constrictor muscle, referred to as "Killian's triangle." The development of ZD is poorly understood, but is thought to be related to impaired cricopharyngeal compliance causing increased intrabolus pressure while swallowing with subsequent herniation. The recurrent laryngeal nerves (RLN) travel along the tracheoesophageal groove bilaterally and pass through the fibers of the inferior constrictor muscle and along the posterior side of the cricopharyngeus to become the inferior laryngeal nerves. Because of the nerves' proximity to the base of a ZD, they are prone to injury during ZD repair.

3.2 | Overview of the ZPOEM Procedure

The cornerstone of ZPOEM is diverticulotomy via incision of the poorly-compliant cricopharyngeus muscle. A submucosal tunnel is made beginning in the posterior hypopharynx 1–2 cm proximal to the muscular septum created by the cricopharyngeus. The tunnel is extended to the septum, then extended on either side in a bifid tunnel surrounding the septum. The isolated septum is cut along its entire length. The tunnel entry site is closed with clips [3].

3.3 | Complications of ZPOEM: Known and Emerging Risks

Few reports are available regarding adverse events of ZPOEM due to its recent introduction to the medical repertoire. A multicenter retrospective cohort study of 357 patients showed a 96.3% technical success rate, 11.2% recurrence rate, and 12.4% adverse event rate [4]. The most common adverse events are bleeding and perforations or leaks. While VFP has been rarely reported in the literature following other esophageal procedures, such as high esophageal dilation [5], VFP has not been described previously following ZPOEM.

We considered several possible mechanisms to explain the occurrence of VFP in our case. First, direct thermal or mechanical injury to the RLN during septum division is plausible. The RLN is in close proximity to the diverticulum as it ascends in the tracheoesophageal groove and enters the larynx near the cricopharyngeus muscle. Second, external compression of the RLN by a distended diverticular pouch or phlebolith, potentially exacerbated by intraoperative manipulation, may have contributed to transient neuropraxia. Third, intraoperative endotracheal tube cuff pressure may have caused localized nerve compression, especially in an anatomically vulnerable patient. Complete transection is unlikely given the gradual clinical recovery observed. While any of these three mechanisms is possible, the authors consider it most likely in this specific case

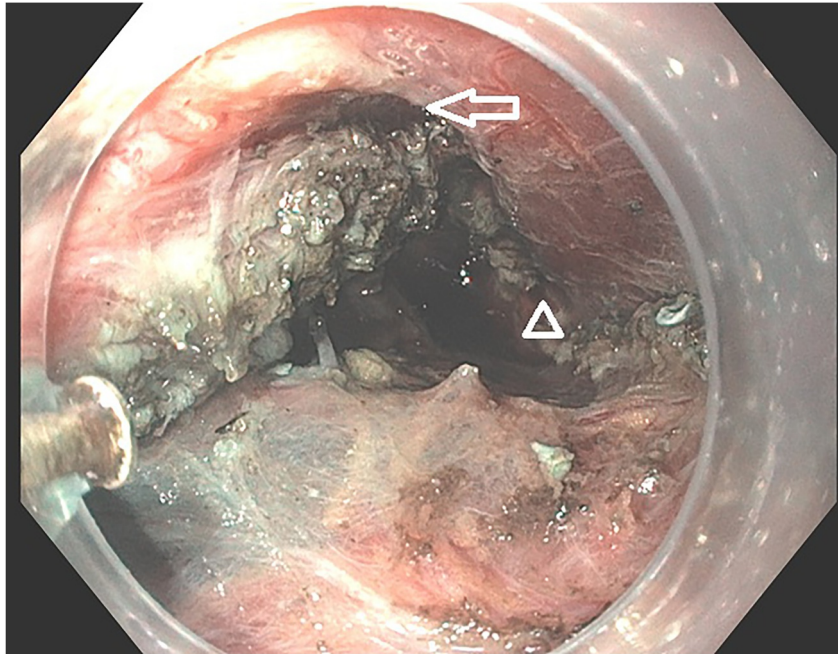


FIGURE 2 | Intraoperative view of completed cricopharyngomyotomy performed using ERBE T-knife, with the esophageal mucosa visible superiorly (arrow) and ZD visible inferiorly (triangle).

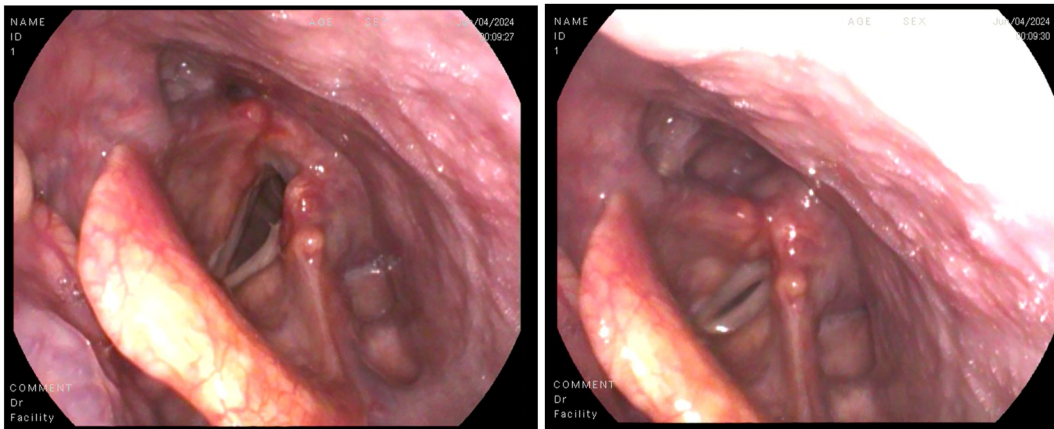


FIGURE 3 | Weakness, foreshortening, and bowing of the left vocal fold visible on abduction (left) and adduction (right) using flexible fiberoptic laryngoscopy. Post-treatment laryngoscopy was essentially normal, so it is not shown here.

that VFP was induced by mechanical force during surgical manipulation, against a more vulnerable RLN in the setting of a large obstructive stone.

known obstructive stones within the diverticulum. Ongoing education regarding emerging complications of newer procedures like ZPOEM will enhance safety and procedural success.

3.4 | Clinical Implications and Recommendations for Practice

The occurrence of VFP following ZPOEM highlights the need to maintain a high index of suspicion for this complication, even in the absence of prior reports. A vocal assessment should be considered as part of a preoperative evaluation and comprehensive counseling should address the potential risk of VFP. While further data will need to be collected before formal guidelines can be developed, we suggest flexible laryngoscopy in patients reporting subjective hoarseness preoperatively, or with

4 | Conclusion

ZPOEM is well-tolerated and rates of adverse events are generally low, with bleeding and perforation being most common. VFP is a rare adverse event following ZPOEM. As with other types of VFP, management includes medialization procedures, speech therapy, and continued clinical assessment over time. Clinicians should consider preoperative vocal assessment and counsel patients on this emerging risk to ensure informed decision-making and optimize outcomes.

Author Contributions

Natalie Weiss: conceptualization (equal), investigation (lead), methodology (lead), project administration (lead), writing – original draft (lead), writing – review and editing (equal). **Kendra Walker:** conceptualization (supporting), investigation (supporting), writing – original draft (supporting), writing – review and editing (equal). **Katerina Green:** conceptualization (supporting), investigation (equal), project administration (equal), writing – review and editing (supporting). **Hannah Daniel:** conceptualization (supporting), writing – review and editing (equal). **Amy Rutt:** conceptualization (lead), investigation (equal), methodology (equal), project administration (supporting), resources (lead), supervision (lead), writing – original draft (supporting), writing – review and editing (equal).

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Ethics Statement

This study was conducted under the guidance of the Mayo Clinic IRB, and informed consent was signed by the patient for use of his data.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this case report are derived from the patient's electronic medical record. Due to the nature of this data and the need to protect patient privacy, the underlying data are not publicly available.

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