



Zenker Diverticulum: Does Size Correlate with Preoperative Symptoms?

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Abstract

Introduction Zenker diverticulum (ZD) usually affects adults after the 7th decade of life. Treatment for ZD is indicated for all symptomatic patients, but some patients prefer to defer surgical treatment until symptoms get worse and decrease their quality of life.

Objective To evaluate the association of the preoperative symptoms in ZD patients with the size of the ZD.

Methods A retrospective study design. Electronic medical records were used to identify patients diagnosed with ZD and treated over 11 years. Data collection included the chief complaints and symptoms, medical history, and findings on radiologic swallow evaluations of the patients. The diverticulum size was stratified into 3 groups: small (< 1 cm), moderate (1–3 cm), and large (> 3 cm).

Results A total of 165 patients were enrolled and stratified by diverticulum size (48 small, 67 medium, and 50 large). Dysphagia, cough, and regurgitation were the most prevalent symptoms. Dysphonia was more frequent among patients with a small pouch. Logistic regression analysis showed that dysphagia and choking were associated with large and medium diverticulum size ($p < 0.05$). Additionally, dysphonia was significantly associated with the presence of a small-sized ZD ($p < 0.04$).

Conclusion Upper gastrointestinal symptoms such as dysphagia and choking may be associated with a ZD > 1 cm and should always be evaluated. Additionally, the presence of dysphonia was found to be correlated with a ZD < 1 cm, suggesting that a prompt and appropriate fluoroscopic evaluation must be considered in those patients in whom no other clear cause of dysphonia is evident.

Keywords

- ▶ zenker diverticulum
- ▶ pharyngeal pouch
- ▶ esophageal diverticulum
- ▶ dysphagia
- ▶ dysphonia

Introduction

Zenker diverticulum (ZD) or pharyngeal pouch is a rare disorder affecting 2 in every 100,000 people. The incidence is male predominant (ratio 1:5) and usually occurs in

middle-aged adults and older adults in the 7th or 8th decades of life. The etiology of ZD remains controversial; however, the presence of a structural or functional abnormality of the cricopharyngeus muscle plays an important role.^{1–3} Patients presenting to the otolaryngology clinic with ZD often have

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multiple complaints. The co-occurrence of pathologies such as gastroesophageal reflux disease (GERD) or hiatal hernia makes the clinical evaluation of these patients a clinical challenge to decipher which swallowing complaints are related to the ZD.⁴

Common clinical presentations include dysphagia, regurgitation, choking, chronic cough, aspiration pneumonia, globus, weight loss and, less commonly, dysphonia.⁵ Clear clinical history and physical examination, associated with positive findings on radiologic swallow evaluation – modified barium swallow study (MBSS) and barium esophagram – are crucial for the diagnosis and size classification of ZD.⁶ According to Van Overbeek the ZD size can be classified using a radiological scale into a small pouch when it is shorter than one vertebra, and into a large pouch when it is longer than three vertebrae.⁷ This classification provides a better understanding of the correlation of the symptoms of the patient with diverticulum size to improve clinical insight in diagnosis, treatment planning, and preoperative counseling.

Treatment for ZD is indicated for all symptomatic patients, but some patients prefer to defer surgical treatment until symptoms get more persistent and decrease their quality of life.⁸ Some studies have evaluated the relation of some clinical symptoms, such as globus and regurgitation, with diverticulum size in patients with ZD who underwent surgical procedures. However, studies that assessed the preoperative clinical presentations with diverticulum size in ZD patients are currently lacking. The present study aims to evaluate the association of the preoperative symptoms in ZD patients with the diverticulum size.

Methods

A retrospective study design approved by the Institutional Review Board (IRB 20–003440) was conducted. Electronic medical records (EMR) were used to identify patients diagnosed with ZD (ICD-10: K22.5 diverticulum of the esophagus, acquired) from January 2009 through April 2020. A total of 165 patients were identified and enrolled after the inclusion and exclusion criteria were applied. A chart review of clinical data, including the first visit to the otolaryngology clinic, previous medical history, and findings on the radiologic swallow evaluation with MBSS or a barium esophagram, was completed. The initial medical evaluation included the assessment of the presenting complaint and symptoms, including dysphagia, odynophagia, dysphonia, cough, choking, regurgitation, aspiration, globus, and weight loss. The intraoperative reports were also examined to evaluate the ZD size and the method of treatment. The ZD size was stratified into 3 groups: small (< 1 cm), moderate (1–3 cm), and large (> 3 cm). Surgical treatment included open diverticulectomy with or without cricopharyngeal myotomy, endoscopic CO2 laser or staple diverticulectomy, and cricopharyngeal myotomy. All the data were collected from the medical record and stored in a RedCap database.

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, NY, USA). Standard descriptive statistics were obtained and

presented as percentages, mean ± standard deviations (SDs). A parametric statistical analysis (student *t*-test) was used to compare demographics and comorbidities between the groups of patients. Additionally, a Pearson correlation and a logistic regression analysis were also performed to evaluate the association of presenting symptoms (independent variables) and the ZD size (dependent variable). A *p*-value < 0.05 was considered statistically significant.

Results

The mean age of the patients among the overall cohort was 73 years old (range 39–96 years old) with a 1.2:1 male/female ratio. Pre-existing GERD diagnosis was present in 65.5% of the patients, and 43.5% of the patients reported a history of tobacco consumption. Thirty-eight patients had a diagnosis of hiatal hernia (23%). There was no difference in age, gender distribution, body mass index (BMI), frequency of hiatal hernia, and comorbidities between groups (*p* > 0.05). The demographic summary of ZD patients is shown in ►Table 1.

Small ZD size (< 1 cm) was found in 48 patients, medium size (1–3 cm) in 67 patients, and large size (> 3 cm) in 50 patients. The prevalence of symptoms per ZD size is shown in ►Table 2. Dysphagia was the most prevalent symptom among all patients (89.1%), followed by cough (65.5%) and regurgitation (58.8%). Dysphonia was a more frequent symptom among patients with a small ZD (22%) than in those with a medium and large diverticulum (9 and 4%, respectively).

Table 1 Demographic Summary and Clinical characteristics, overall cohort.

Characteristics	n = 165
Gender, No. (%), male	92 (55.8)
Mean age, y (range, SD)	73 (39–96, 11)
BMI kg/m ² , mean (SD)	26.9 (5.6)
Tobacco consumption, No. (%)	71 (43.5)
EtOH consumption, No. (%)	56 (34.3)
Radiologic evaluation	
MBSS, No. (%)	108 (67.5)
Esophagram, No. (%)	146 (90.6)
Comorbidities	
Hypertension, No. (%)	86 (52.1)
Diabetes Mellitus, No. (%)	19 (11.5)
Dyslipidemia, No. (%)	75 (45.5)
GERD, No. (%)	108 (65.5)
OSA, No. (%)	18 (11)
Hiatal Hernia, No. (%)	38 (23)

Abbreviations: BMI, Body Mass Index; EtOH, Ethanol; GERD, Gastroesophageal reflux disease; MBSS, Modified barium swallow study; OSA, Obstructive sleep apnea; SD, standard deviation.

Table 2 Prevalence of symptoms according to Zenker Diverticulum size

	All		Small		Medium		Large	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Dysphagia	147	89.1%	37	77.1%	64	95.5%	46	92%
Cough	108	65.5%	30	62.5%	44	65.7%	34	68%
Regurgitation	97	58.8%	23	47.9%	44	65.7%	30	60%
Globus	80	48.5%	20	41.7%	31	46.3%	29	58%
Choking	61	37%	8	16.7%	27	40.3%	26	52%
Aspiration	31	18.8%	7	14.6%	16	23.9%	8	16%
Dysmotility	23	13.9%	6	12.5%	8	11.9%	9	18%
Weight loss	20	12.1%	2	4.2%	9	13.4%	9	18%
Dysphonia	19	11.5%	11	22.9%	6	9%	2	4%
Odynophagia	11	6.7%	3	6.3%	4	6%	4	8%

Table 3 Pearson correlation between presenting symptoms and Zenker Diverticulum size

	<i>r</i>	<i>p-value</i>
Dysphagia	0.18	0.019
Choking	0.28	0.001
Weight loss	0.16	0.037
Dysphonia	-0.22	0.003

Correlation Coefficients

Pearson correlation between presenting symptoms and ZD size was performed and is shown in ►Table 3. A small but statistically significant positive correlation was found between ZD size and choking ($r = 0.28$; $p = 0.001$), dysphagia ($r = 0.18$; $p = 0.019$), and weight loss ($r = 0.16$; $p = 0.037$). Also, a statistically significant negative correlation between ZD size and dysphonia ($r = -0.22$; $p = 0.003$) was noted.

Logistic Regression

Our logistic regression model showed a statistically significant relationship between the presence of dysphagia and choking with the presence of a medium-sized and large-sized ZD when compared with small-sized diverticula ($p < 0.05$). The odds ratio (OR) of dysphagia to be associated with a medium diverticula was 9.7 (95% confidence interval (CI): 2.0–46.1; $p = 0.004$) and the OR associated with a large-sized diverticula was 6.0 (95%CI: 1.3–27.0; $p = 0.018$). The OR of choking associated with a medium diverticula was 4.8 (95%CI: 1.5–15.2; $p = 0.008$), and with large diverticula it was 5.6 (95%CI: 1.8–17.5; $p = 0.003$). Although dysphonia was the least frequent symptom among the three groups of patients, its presence was significantly associated with the presence of a small-sized ZD when compared with a bigger ZD ($p < 0.04$). The full details of our logistic regression analysis are presented in ►Table 4.

Discussion

The present study evaluated the presence of preoperative symptoms among a large cohort of patients with a diagnosis of ZD and its association with the documented diverticulum size. Our population showed an elderly male predominance, agreeing with the data found in several cohort studies.^{9–13} The coprevalence of GERD and hiatal hernia was also evident in our sample. These two pathologies have been commonly reported as co-occurring conditions in individuals with ZD, making their symptoms easily confused with the presence or recurrence of a pharyngeal pouch.^{10,14,15} This finding confirms the importance of early treatment, as the presence of ZD could lead to a nutritional compromise and to a potential escalating comorbidity over time.¹⁶ Our results showed that dysphagia, cough, regurgitation, and globus are the most prevalent symptom among all groups.

Interestingly, a global incidence of dysphonia of 11.5% was also found among our patients. This is consistent with other studies (Palmer et al., 2007; Bergeron et al., 2013; Greene et al., 2015).^{9,10,12} For example, Greene et al. reported dysphagia caused by outflow resistance in the esophagus as the primary preoperative symptom in their cohort of 77 patients, followed by regurgitation and cough.¹² Palmer et al. surveyed symptoms before and after the endoscopic repair of the ZD among a group of 72 patients, finding that food avoidance, regurgitation, choking, and cough were the most prevalent clinical manifestations.¹⁰ A difference in the study design (i.e., both pre- and postsurgical repair were included relative to our study) could explain the difference in the results.

Our data also indicates that dysphagia and choking are significantly associated with the presence of a medium-sized or large-sized pharyngeal pouch. Bergeron et al. evaluated the characteristics of dysphagia and its correlation with the ZD size within a cohort of 46 patients. Their findings were similar to our data, suggesting the relationship between dysphagia and regurgitation with a medium or large ZD size, and highlighting the importance of a radiologic swallow evaluation if patients with a history of ZD removal persist

Table 4 Logistic regression model between clinical symptoms and Zenker Diverticulum size

	β -value	Standard Error	OR (95%CI)	p-value
Dysphagia				
Small (> 1 cm)	Reference			
Medium (1–3 cm)	2.27	0.79	9.75 (2.06–46.16)	0.004*
Large (> 3 cm)	1.80	0.76	6.06 (1.36–27.04)	0.018*
Choking				
Small (> 1 cm)	Reference			
Medium (1–3 cm)	1.57	0.58	4.81 (1.51–15.28)	0.008*
Large (> 3 cm)	1.72	0.58	5.63 (1.8–17.56)	0.003*
Dysphonia				
Small (> 1 cm)	Reference			
Medium (1–3 cm)	–1.34	0.64	0.26 (0.74–0.91)	0.036*
Large (> 3 cm)	–1.99	0.84	0.13 (0.02–0.75)	0.023*
Regurgitation				
Small (> 1 cm)	Reference			
Medium (1–3 cm)	0.27	0.49	1.31 (0.5–3.46)	0.576
Large (> 3 cm)	0.04	0.52	1.04 (0.37–2.91)	0.939
Globus				
Small (> 1 cm)	Reference			
Medium (1–3 cm)	–0.41	0.49	0.65 (0.24–1.73)	0.398
Large (> 3 cm)	0.11	0.53	1.11 (0.39–3.17)	0.833

with dysphagia.⁹ However, our study benefited from having a larger sample size and not previously analyzed symptoms such as dysmotility, dysphonia, weight loss, and other medical history variables.

Only one study, by Schoeff et al., has identified dysphonia as a disease feature among patients with ZD. Although they found dysphonia as an unrecognized preoperative complaint, a significant improvement in the voice handicap index-10 (VHI-10) before and after surgery was noted.¹⁷ Our results correlate with this study, as the incidence of dysphonia within the groups of patients with a medium-sized and large-sized diverticulum was also low. We hypothesize that the misperception and underestimation of voice handicap among individuals with ZD can explain this finding. We also hypothesize that the presence of dysphonia among patients with a small pouch could have caused an early endoscopic evaluation and diagnosis during the study of more prevalent causes of dysphonia, including GERD, more than the ZD per se. It is noteworthy that radiologic swallow evaluation with MBSS or a barium esophagram has been widely recommended for patients with suspected structural abnormalities, including ZD.^{6,18} Our results contribute to the literature and can be the starting point to consider a fluoroscopic swallowing evaluation among those patients in whom no other apparent cause of dysphonia is documented.

Limitations

As a retrospective study, there are several intrinsic limitations to consider. For example, cointerventions and confounders could not be controlled due to the nature of our study. In some medical records, limited data were available, including notes regarding the improvement of symptoms after the surgical repair of the ZD and voice-related questionnaires. We consider that further prospective studies with larger sample sizes and a complete preoperative and postoperative evaluation of symptoms will increase the statistical power. Additionally, to confirm our findings, studies involving the preoperative and postoperative assessment of patient-reported outcome measures, including the VHI-10, Glottal Function Index (GFI), Reflux Symptoms Index (RSI), and the Voice-Related Quality of Life score (VRQOL), are needed.

Conclusions

Our study suggests that upper gastrointestinal symptoms such as dysphagia and choking may be associated with a ZD > 1 cm and should always be evaluated. Additionally, the presence of dysphonia was found to correlate with a ZD < 1 cm, suggesting that a prompt and appropriate fluoroscopic evaluation must be considered in those patients in whom no other clear cause of dysphonia is evident.

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None.

Conflict of Interests

The authors have no conflict of interests to declare.

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