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Zenker's Diverticulum: 20 Years of Experience and Outcomes of Surgical Resection

Zenker Divertikülü: 20 Yıllık Tecrübe ve Cerrahi Rezeksiyon Sonuçları

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ABSTRACT Objective: Zenker's diverticulum (ZD) is a rare esophageal disorder usually seen in the elderly population. Although traditional transcervical diverticulectomy (TD) has been replaced by endoscopic diverticulectomy (ED), which have been reported to have successful results in recent years, surgical treatment is still the preferred treatment option. We aimed to present the outcomes of our surgical series of 20 years in this study. **Material and Methods:** We retrospectively reviewed the data of patients operated due to ZD between 1999 and 2019. Demographic data, symptoms, type of surgery, and postoperative complications of the patients were analyzed. **Results:** Eighteen patients were included in the study. Dysphagia was the main complaint in 89% (16/18) of patients preoperatively. Open surgical approach was applied to all patients. Diverticula excision was performed in 17 patients and diverticulopexy was performed in 1 case. Major postoperative complications were observed in 3 patients. All patients were discharged with improvement in their symptoms except one patient who was operated with recurrent diverticulum. In this patient, oesophageal stricture was developed and percutaneous endoscopic gastrostomy was needed. **Conclusion:** Although endoscopic therapeutic methods are used increasingly in the treatment of ZD, surgical treatment is still an option with successful results and retains its place as the preferred method in the treatment of ZD. Surgery is also the prior option of recurrent ZD cases.

Keywords: Zenker's diverticulum; diverticulopexy; transcervical diverticulectomy; endoscopy, digestive system; diverticulum, esophageal

ÖZET Amaç: Zenker divertikülü (ZD), genellikle yaşlı popülasyonda görülen nadir bir özofagus hastalığıdır. Geleneksel transservikal divertikülotomi (TD), yerini son yıllarda başarılı sonuçlar verdiği bildirilen endoskopik divertikülotomiye (ED) bıraksa da cerrahi tedavi hâlen tercih edilen tedavi seçeneğidir. Bu çalışmada, 20 yıllık cerrahi serimizin sonuçlarını sunmayı amaçladık. **Gereç ve Yöntemler:** 1999-2019 yılları arasında ZD nedeniyle ameliyat edilen hastaların verilerini geriye dönük olarak gözden geçirdik. Hastaların demografik verileri, semptomları, ameliyat tipi ve postoperatif komplikasyonları incelendi. **Bulgular:** Çalışmaya, 18 hasta dâhil edildi. Hastaların %89'unda (16/18) ameliyat öncesi başlıca şikâyet disfaji idi. Tüm hastalara, açık cerrahi yaklaşım uygulandı. On yedi hastaya divertikül eksizyonu, 1 hastaya divertikülopeksi yapıldı. Üç hastada, postoperatif majör komplikasyonlar görüldü. Tekrarlayan divertikül ile ameliyat edilen 1 hasta dışında tüm hastalar semptomlarında düzelme ile taburcu edildi. Bu hastada, özofagus darlığı gelişti ve perkütan endoskopik gastrostomi gerekti. **Sonuç:** ZD tedavisinde, endoskopik tedavi yöntemleri giderek daha fazla kullanılsa da cerrahi tedavi hâlen başarılı sonuçlarla bir seçenektir ve ZD tedavisinde tercih edilen yöntem olarak yerini korumaktadır. Tekrarlayan ZD vakalarında, cerrahi de öncelikli seçenektir.

Anahtar Kelimeler: Zenker divertikülü; divertikülopeksi; transservikal divertikülotomi; endoskopi, sindirim sistemi; divertikül, özofageal

Zenker's diverticulum (ZD) is an esophageal pseudodiverticulum formed by cricopharyngeal muscle dysfunction leading to outpouching of mucosa and submucosa from the Killian triangle.[1] It's wall is thin and fragile because it does not contain a muscle layer. Symptomatic disease is usually seen in the elderly population and the main symptom of the disease is dysphagia.[1,2] In recent years, traditional

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surgical resection techniques [transcervical diverticulectomy (TD)] have been replaced by transoral endoscopic methods [endoscopic diverticulectomy (ED)]. There are studies specifically indicating the effectiveness of flexible endoscopic interventions.[3,4] However, open surgical techniques are still the preferred and applied method in many centers. Herein, we would like to present the outcomes of ZD patients who underwent surgical treatment in our clinic.

MATERIAL AND METHODS

Patients operated due to the ZD in Department of General Surgery, Cerrahpaşa Faculty of Medicine, İstanbul University-Cerrahpaşa between 1999 and 2019 were retrospectively examined and included in this study. Demographic data of the patients, preoperative symptoms, and radiological findings were evaluated. Fluoroscopy-guided barium swallow radiograph was used as the radiological evaluation method. Except for the localization and diameter of the diverticulum, the presence of esophageal stenosis, fistula, or other concominant findings were evaluated in real-time by fluoroscopy. Type of surgery, used methods, and postoperative complications were analyzed. Local ethics committee approval was obtained from Clinical Researches Ethics Committee of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine (date: 4/13/2020, number: 53690). This study was conducted according to the World Medical Association Declaration of Helsinki.

RESULTS

Eighteen patients were included in the study. Fifteen patients had primary ZD, 3 patients were recurrent ZD. Of the patients, 13 were male (73%) and 5 (27%) were female. Their mean age was 63.5 (age range: 35-91 years). In 94.4% of the patients, the main complaint at the first admission was dysphagia, 28% had symptoms related to regurgitation, and 28% had halitosis (bad breath). Other diverticulum-related symptoms in patients were globus sensation (22%) and odynophagia (17%).

Fluoroscopy-guided barium swallow radiographs (BSR) were applied to all patients preoperatively (Figure 1 and Figure 2). The average diverticulum diameter was measured as 3.5 cm (diameter range: 2.5-5 cm). All diverticula were localized on the left except one (right). No complicated finding was detected with barium radiography. Preoperative endoscopy was performed for 10 patients (67%) with reflux symptoms. Findings consistent with reflux esophagitis were found in three patients (17%) with odynophagia by endoscopy.

FIGURE 1: Barium swallow radiograph showing diverticulum.

FIGURE 2: Barium swallow radiograph showing diverticulum.

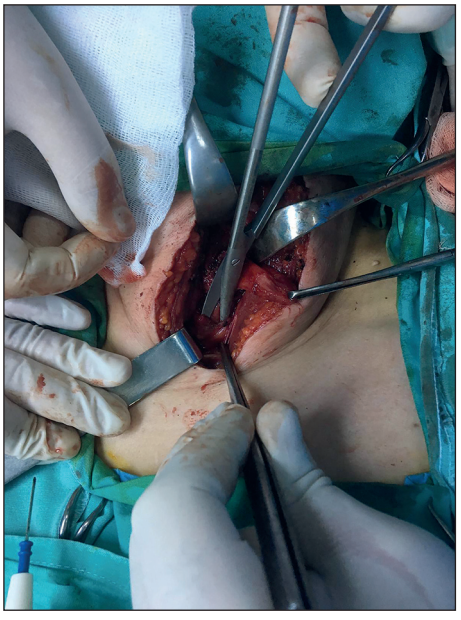

FIGURE 3: Cricopharyngeal myotomy.

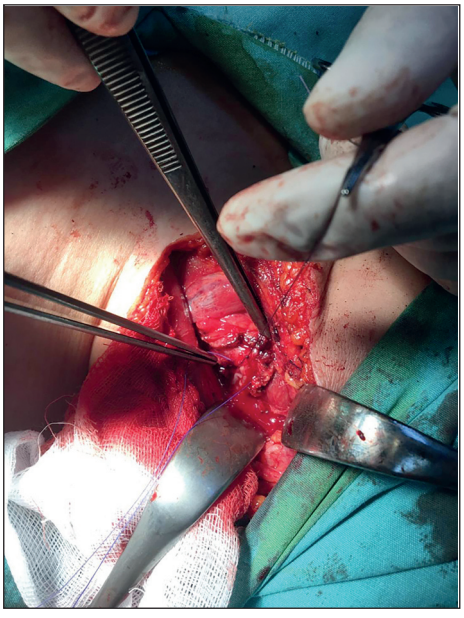

FIGURE 4: Operative scene of diverticula excision.

All patients were operated under general anesthesia with open surgical procedure. Right neck incision was preferred in one patient with right-sided diverticula; while left incision was done in all other patients. Cricopharyngeal myotomy was performed in all patients (Figure 3). Diverticula excision was preferred in 17 patients and diverticulopexy was done in 1 patient (Figure 4 and Figure 5). Stapler was preferred in 12 patients who underwent resection; in 6 patients hand-sewn closure was used. Although varying according to each patient, the nasogastric tube was removed between the postoperative 3rd day and 7th day, and oral treatment was started. No malignancy was detected in the examination of the excision materials.

Major complications occurred in three patients postoperatively. Hematoma developed in one patient and hematoma drainage was applied. The other two complications were seen in patients operated due to recurrent ZD. Both two had developed tracheal stenosis temporarily and tracheostomy was required. Tracheostomies were closed after recovery. One of them had esophageal stenosis and severe dysphagia as to need percutaneous endoscopic gastrostomy. In one of the patients, after the operation, fistula occurred. The patient was followed conservatively and the fistula was closed spontaneously.

FIGURE 5: Excised diverticulum specimen.

There was no significant difference between manual closure and stapler closing in terms of complications. No residual diverticulum or contrast extravasation was encountered in the control fluoroscopy-guided BSR of the patients postoperatively. In one patient, an esophageal stricture determined.

Laparoscopic Nissen fundoplication was added to three patients with severe reflux symptoms and

esophagitis in addition to the diverticulum operation. No complication has been observed related to these additional procedures. All the patients have been discharged. The average hospitalization time was 4.9 days (range: 3-15 days).

Our study has some limitations including the small number of patients, retrospective and single center design. Because it was a long-term retrospective study and due to insufficient data, it could not be evaluated according to the classification methods used for ZD.

DISCUSSION

ZD is a pouch between the inferior pharyngeal constrictor muscle and the cricopharyngeus muscle. It is a thin-walled and fragile pseudodiverticulum formation because it involves only the mucosa and submucosal layers but not the muscular layers.[1,2,5] It is usually the disease of advanced ages and the proportion of male to female is 2:1.[3] Although the patients are mostly above 50 years of age in our study, it was determined at a younger age in two patients.

Small diverticulae may be asymptomatic; however, symptoms such as dysphagia, regurgitation, and sensation of globus are added as diverticulum becomes larger.[6] In 80-90% of patients, the main symptom is dysphagia. In our study, similarly dysphagia was the initial symptom in 88% of the patients.[3] Although the association of gastroesophageal reflux disease (GERD) with ZD is speculative; endoscopic and other evaluations should be performed for patients with symptoms such as heartburn or chest pain.[6] The barium swallow study is the main diagnostic method for ZD.[2,7] Endoscopy should only be performed in cases with GERD symptoms because as mentioned above ZD is a very fragile pouch. Entering into diverticulum during endoscopy may increase the risk of perforation.[6] For the management of the diverticulum sac, three options are mainly used: resection (diverticulectomy), suspension (diverticulopexy), or inversion. The most preferred method with the highest success rate is diverticulectomy with or without myotomy.[8]

Treatment for symptomatic ZD can be surgical or endoscopic (rigid endoscopy-flexible endoscopy). Although success rates are similar, each method has different advantages and disadvantages.[8] Endoscopic ZD treatments (ED) are reported as safe and effective treatment methods.[9] They provide short hospitalization time, high functional recovery, and low complication rates.[3,4,10-12] However, surgical treatment (TD) remains as an alternative in centers without equipment and experience in transoral treatment methods. Surgery is still at the forefront in patients with large symptomatic diverticulum, as well.[13,14] Postoperative complications of open surgery include fistula formation, abscess, hematoma, recurrent laryngeal nerve paralysis. The most important complication of endoscopic methods is perforation. The rigid endoscope approach cannot be performed in patients with limited neck mobility, dental problems, inadequate jaw opening. In this respect, flexible endoscopy that can also be applied with sedation without requiring general anesthesia seems to be more useful.[3]

Although the success rates of both techniques are comparable in the literature, open surgical techniques still have some advantages as reported in the literature.[1]

Jackson et al. report that TD shows low recurrence compared to the endoscopic stapling.[15] Seth et al. reported that complete resolution of symptoms was achieved more often in those who underwent open surgery than the endoscopic treatment group.[16] Therefore, the open surgical approach has higher surgical success but should be applied to selective cases due to its perioperative morbidity. In our series, that we performed open surgery in all patients, we encountered 17% major complications. Kannabiran et al. recommend TD in young patients with low surgical cardiovascular risk and ED to high-risk elderly patients.[17] Tabola et al. emphasized the applicability of TD to all age groups in their 44 cases.[14] In a review by Yuan et al., open surgery, rigid endoscopy and fragile endoscopy methods were compared. The advantages and disadvantages of these different three surgical approaches according to the study are detailed in Table 1.[8]

Consequently, the method to be selected in the treatment of ZD varies depending on the age and comorbidity of the patient, the dimensions of the diver-

TABLE 1: Comparison of different surgical approaches.

	Open surgery	Rigid endocsopy	Flexible endoscopy
Complication rate	Higher	Lower	Unclear
Hospital discharge	More	Less	Less
Cervical scar	Yes	No	No
Conversion	Never	Occasional	Rare
General anesthesia	Mandatory	Usual	Optional
Neck extension	No	Mandatory	No
Recurrence	A few	Unclear	Unclear
Treatment sessions	Most 1	Most 1	Most >1
Anatomic limitations, stiff neck, poor mouth opening, etc.	No	Yes	No
Small diverticulum	Suitable	Unsuitable	Unsuitable
Large diverticulum	Suitable	Unsuitable	Unsuitable
Reoperation	Hard, risky	Easy, safe	Easy, safe
Special technique	No	Yes	Yes
Dental injury	No	Yes	Yes
Recurrent nerve injury	Yes	Rare	Rare

ticulum, the facilities of the center, and the surgeon's experience.

CONCLUSION

TD is still an effective and successful treatment in the treatment of ZD. It can be applied to all age groups. For the management of ZD, a multidisciplinary approach is required in a fully equipped center.

Informed Consent

Written informed consent was not necessary because no patient data has been included in the manuscript.

Availability of Data and Materials

The materials described in the manuscript will be freely available to any scientist wishing to use them for non-commercial purposes, without breaching participant confidentiality.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

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