



## Comparison of Clinical Features and Outcomes of Foreign Bodies in the Cervical Oesophagus and Thoracic Oesophagus Treated with Rigid Esophagoscopy in Adults: 10 Years of Experience

Erişkinlerde Rijit Özofagoskopi ile Tedavi Edilen Servikal Özofagus ve Torasik Özofagustaki Yabancı Cisimlerin Klinik Özellikleri ve Sonuçlarının Karşılaştırılması: 10 Yıllık Deneyim

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### ABSTRACT

**Aim:** We aimed to compare the clinical features and outcomes of foreign bodies (FBs) in the cervical and thoracic oesophagus treated with rigid esophagoscopy in adults.

**Material and Method:** This single-centre study was designed as a retrospective study at a tertiary health centre between March 2010 and December 2020. The clinical records and files of patients over 18 treated with rigid esophagoscopy due to oesophageal foreign bodies (OFBs) were reviewed. The cases were divided into the cervical and thoracic oesophagus groups, according to where FBS were stuck. Outcomes were evaluated as complications and mortality occurring in the first 30 days after FB intake. Since there was no mortality in any patient, outcomes were only complications.

**Results:** Of the 194 patients, 119 (61.3) were female, and the mean age was 48.45±16.10 years. The most common FB localisation was the cervical oesophagus, with 88.7%, and the remainings at the thoracic oesophagus. The morbidity rate of the study was 4.6%, with no mortality. In comparing the groups, non-bone FBs were detected more frequently in the thoracic oesophagus group (p=0.036). Dysphagia was common in FBs in the cervical oesophagus group, and chest pain in FBs in the thoracic oesophagus group (p<0.001). Length of hospital stay (p=0.018), morbidity rate (p=0.011), and additional surgical intervention (p=0.034) were higher in patients with a FB in the thoracic oesophagus.

**Conclusion:** FBs in the thoracic oesophagus are challenging to manage due to high morbidity rates, perforation rates, and hospital stays.

**Keywords:** Foreign body, morbidity, oesophagus, perforation

### ÖZ

**Amaç:** Erişkinlerde rijit özofagoskopi ile tedavi edilen servikal ve torasik özofagustaki yabancı cisim (YC)lerin klinik özelliklerini ve sonuçlarını karşılaştırmayı amaçladık.

**Gereç ve Yöntem:** Bu tek merkezli çalışma, Mart 2010 ile Aralık 2020 tarihleri arasında üçüncü basamak bir sağlık merkezinde retrospektif çalışma olarak tasarlandı. Özofagus YC'si nedeniyle rijit özofagoskopi ile tedavi edilen 18 yaş üstü hastaların klinik kayıtları ve dosyaları incelendi. Olgular FBS'nin sıkıştığı yere göre servikal ve torasik özofagus gruplarına ayrıldı. Sonuçlar: YC alımından sonraki ilk 30 günde meydana gelen komplikasyonlar ve mortalite olarak değerlendirildi. Hiçbir hastada mortalite olmadığından sonuçlar sadece komplikasyondur.

**Bulgular:** 194 hastanın 119'u (61,3) kadındı ve yaş ortalaması 48,45±16,10 yıldır. En sık YC lokalizasyonu %88,7 ile servikal özofagusta, geri kalanı ise torasik özofagustaydı. Çalışmanın morbidite oranı %4,6 olup mortalite görülmedi. Gruplar karşılaştırıldığında kemik dışı YC'ler torasik özofagus grubunda daha sık tespit edildi (p=0,036). Servikal özofagus grubundaki YC'lerde disfaji, torasik özofagus grubundaki YC'lerde göğüs ağrısı yaygındı (p<0,001). Torakal özofagusta YC gelişen hastalarda hastanede kalış süresi (p=0,018), morbidite oranı (p=0,011) ve ek cerrahi müdahale (p=0,034) daha yüksekti.

**Sonuç:** Torasik özofagustaki YC'lerin yüksek morbidite oranları, perforasyon oranları ve hastanede kalış süreleri nedeniyle tedavisi zordur.

**Anahtar Kelimeler:** Yabancı cisim, morbidite, özofagus, perforasyon

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## INTRODUCTION

Foreign bodies (FBs) obstructing the gastrointestinal tract are among the conditions that require urgent diagnosis and treatment. FB obstruction can cause severe morbidity and mortality worldwide in adults (1). In the Japan Collaborative Cohort Study published in 2022, the mortality due to FBs was 0.18% (2). Almost 70% of oesophageal obstruction cases due to FB are seen in the first narrowing of the oesophagus. The remainings are equally seen in the second narrowing of the gastro-oesophageal junction (3). The nature and characteristics of the swallowed FB may differ according to geographical regions and cultures. In Asian countries, fish bones are the most frequent cause of FBs; whereas in Western countries, impacted meat is prevalent (4). On the other hand, depending on the intensity of headscarf use in Muslim societies, it is common for people to swallow the needle they use for the headscarf while adjusting the headscarf (5). Differently, accidental FB swallow is most common in elderly edentulous or denture wearers. In addition to accidental swallowing of the needle taken into the mouth and an animal bone stuck in the swallowed meat without good chewing; FB ingestion can also be seen in patients with psychiatric disorders, excessive alcohol intake, and inmates (6, 7).

Most swallowed FBs can spontaneously pass through the gastrointestinal tract, but 20% require endoscopic or surgical treatment (8, 9). As the residence time of FBs present in the oesophagus increases, the removal of the object becomes more difficult, and the risk of perforation increases because the spontaneous passage of the oesophagus decreases due to the foreign body, and the oedema resulting from the trauma due to the object compresses the object even more. In such a case, important complications such as perforation, sepsis, fistula and mediastinitis may occur (10, 11). The shape, anatomical location and structure of the FB are crucial components in the perforation clinic. The perforation risk increases up to 15%-35% with the insertion of sharp objects or fishbones (12, 13).

Oesophageal FB (OFB) obstruction is diagnosed by anamnesis, clinical examination, and radiological imaging (14). Common symptoms are odynophagia, choking sensations, vomiting, dysphagia, and bloodless or bloody secretions. However, patients may be asymptomatic. Plain radiography (posterior-anterior and lateral) and thorax computed tomography are helpful in diagnosis. Rigid esophagoscopy is used in the treatment and shows a high success rate.

This study aimed to compare the clinical features and outcomes of FBs in the cervical and thoracic oesophagus treated with rigid esophagoscopy in adults.

## MATERIAL AND METHOD

This single-centre study was designed as a retrospective study after ethical committee approval. The study was conducted in the Thoracic Surgery Clinic of Van Yüzüncü Yıl University Faculty of Medicine, Van, Turkey, between March 2010 and December 2020. During this review period, 328 patients were admitted to our hospital due to FBs in the oesophagus. Since the main group of the study consists of adult patients and patients treated with rigid esophagoscopy, patients under the age of 18 (n=17), patients who followed up with conservative treatment (n=55), patients treated with endoscopy (n=54), and patients referred to our clinic for follow-up in an external center (n=8) were excluded. General characteristics of the 194 patients included in the study were accessed from our hospital's record system (Enlil Hospital Information System) and the patients' medical record archive.

The cases were evaluated in terms of age, gender, type of FB, the location of the FB, main clinical symptoms on admission, hospital admission time, diagnosis method (plain radiography or computed tomography), additional surgical interventions, and complications during follow-up. Based on the location of the FBs, the cases were categorized into two groups: cervical and thoracic oesophagus. FBs are also categorised as bone and non-bone. Moreover, there were three categories for the time to visit the hospital: less than 24 hours, between 24 and 72 hours, and more than 72 hours. Complications and death (mortality) were considered outcomes. Patients who developed complications in the 30 days after surgery were considered as the morbidity-positive group, and those without complications were considered as the morbidity-negative group. There were no mortality, therefore the only consequences were complications.

All procedures performed in studies involving human participants were under the ethical standards of the institutional and national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Ethical approval was received from Van Yüzüncü Yıl University Faculty of Medicine, Van, Turkey (Decision No: 2021/03-13, Date: 19 February 2021).

### Statistical Analysis

Statistical analyses were performed using the IBM Statistical Analyses for Social Sciences (SPSS) ver. 26.0 for Windows. Kolmogorov Smirnov test, Shapiro-Wilk test and evaluation of skewness, kurtosis, and histogram graph were used to evaluate the normality distribution. Standard deviation and mean are given for data that fit the normal distribution, while median, interquartile range and minimum-maximum values are given for data that do not fit the normal distribution. Mann-Whitney U test was used to compare groups, while Chi-Square tests were used to compare qualitative variables. A p-value below 0.05 was considered statistically significant.



## RESULTS

### General Findings

Of the 194 patients who met the study criteria, 119 (61.3) were female, and the mean age was  $48.45 \pm 16.10$  years (from 19 to 84). The most common FB localisation was cervical oesophagus, with 88.7%, followed by mid-oesophageal localisation (6.2%). The most frequently detected FB was bone, with 87.6%, followed by meat, with 5.7%. At admission, dysphagia was the most common symptom, and most patients were hospitalised within the first 24 hours. Plain radiographs were used in 72.7% for definitive diagnosis. Clinical characteristics of patients who underwent rigid esophagoscopy for the oesophageal FB are shown in **Table 1**.

Table 1. Clinical characteristics of patients who underwent rigid esophagoscopy for oesophageal foreign body	
Variables	n (%) or mean $\pm$ standard deviation
Age <sup>a</sup>	48.45 $\pm$ 16.10 (19-84)
Gender <sup>b</sup>	
Female	119 (61.3)
Male	75 (38.7)
Foreign body location <sup>b</sup>	
Cervical oesophagus	172 (88.7)
Thoracic oesophagus	22 (11.3)
Upper-third	6 (3.1)
Mid-third	12 (6.2)
Lower-third	4 (2)
Foreign body <sup>b</sup>	
Bone	170 (87.6)
Non-bone	24 (12.4)
Meat	11 (5.7)
Fruit seed	4 (2.1)
Metal	3 (1.5)
Toothpick	2 (1)
Watch	1 (0.5)
Needle	1 (0.5)
Gelatine paper	1 (0.5)
Fishbone	1 (0.5)
Main symptom on admission <sup>b</sup>	
Dysphagia	150 (77.3)
Pain	26 (13.4)
Odynophagia	18 (9.3)
Time to hospital <sup>b</sup>	
<24 hours	184 (94.8)
24-72 hours	6 (3.1)
>72 hours	4 (2.1)
Main radiological test <sup>b</sup>	
Plain radiography	141 (72.7)
Computed tomography	53 (27.3)
Additional surgery/intervention <sup>b</sup>	
Yes	3 (1.5)
Thoracotomy	2 (1)
Tracheostomy	1 (0.5)
No	191 (98.5)
Hospital stays <sup>a</sup>	3.71 $\pm$ 5.57 (1-65)
Morbidity <sup>b</sup>	
Positive	9 (4.6)
Negative	185 (95.4)

<sup>a</sup>: mean  $\pm$  standard deviation (range), <sup>b</sup>: n (%)

### Outcomes

The morbidity rate of the study was 4.6%, with no mortality. Only oesophageal perforation was detected as morbidity due to FB, and oesophageal perforation was detected in 9 (4.64%) patients; thoracotomy was performed in 2 (1.03%) patients, and tracheostomy was performed in 1 (0.51%) patient due to neck abscess and respiratory distress. The remaining patients were followed up with conservative treatment.

### Comparison of the Study Groups

In comparing the groups, non-bone FBs were detected more frequently in the thoracic oesophagus group ( $p=0.036$ ). Dysphagia was common in FBs in the cervical oesophagus group, and chest pain in FBs in the thoracic oesophagus group ( $p<0.001$ ). Length of hospital stay ( $p=0.018$ ), morbidity rate ( $p=0.011$ ), and additional surgical intervention ( $p=0.034$ ) were higher in patients with a FB in the thoracic oesophagus. A comparison of the clinical features of FBs impacted in the cervical oesophagus, and FBs impacted in the thoracic oesophagus is shown in **Table 2**.

Table 2. Comparison of the clinical features and outcomes of foreign bodies impacted in the cervical and thoracic oesophagus treated with rigid esophagoscopy			
Variables	Cervical oesophagus (N=172)	Thoracic oesophagus (N=22)	P value
Age <sup>a</sup>	96.51	105.25	0.492*
Gender <sup>b</sup>			0.487**
Female	107 (62.2)	12 (54.5)	
Male	65 (37.8)	10 (45.5)	
Foreign body <sup>b</sup>			0.036**
Bone	154 (89.5)	16 (72.3)	
Non-bone	18 (10.5)	6 (27.3)	
Main symptom on admission <sup>b</sup>			<0.001**
Dysphagia	140 (81.4)	10 (45.5)	
Chest pain	16 (9.3)	10 (45.5)	
Odynophagia	16 (9.3)	2 (9.1)	
Time to hospital <sup>b</sup>			0.364**
<24 hours	163 (88.6)	21 (11.4)	
24-72 hours	6 (100)	0 (0)	
>72 hours	3 (75)	1 (25)	
Main radiological test <sup>b</sup>			0.312**
Plain radiography	127 (73.8)	14 (63.6)	
Computed tomography	45 (26.2)	8 (36.4)	
Additional surgery/intervention <sup>b</sup>			0.034**
Yes	1 (0.6)	2 (9.1)	
No	171 (99.4)	20 (90.9)	
Morbidity <sup>b</sup>			0.011**
Positive	5 (2.9)	4 (18.2)	
Negative	167 (97.1)	18 (81.8)	
Hospital stays <sup>a</sup>	94.22	123.18	0.018*

<sup>a</sup>: mean rank, <sup>b</sup>: n (%). \*Mann Whitney U test, \*\*Pearson chi-square.

## DISCUSSION

Foreign body (FB) ingestion has become a relatively common clinical problem, estimated at 13 cases per 100,000 people (15) and accounting for approximately 1500 deaths in the USA annually (6). FB represent a major challenge for emergency department physicians, pediatricians, general surgeons, anesthesiologists, otolaryngologists, and radiologists. The majority of ingested FBs are benign courses that will naturally pass spontaneously through the gastrointestinal tract without harm; however, up to 20% of the patients require intervention, and approximately 1% of patients require surgery (1).

The oesophagus, divided into the cervical oesophagus, thoracic (mediastinal), oesophagus, and abdominal oesophagus, is a muscular tubular structure extending from the 6th cervical to the 11th thoracic vertebra (16). The oesophagus has anatomical stenosis in 3 places: the first is stenosis caused by the cricopharyngeal muscle at the entrance of the oesophagus. It is the place where the oesophageal diameter is the narrowest. The second stenosis is where the left main bronchus and arcus aorta cross the oesophagus, and the final is where the oesophagus crosses the diaphragm. Seventy per cent of oesophageal FBs are situated at the level of the cricopharyngeal muscle (cervical oesophagus), 15% in the thoracic oesophagus and 15% in the gastroesophageal junction (17). On the other hand, there was a male predominancy in the literature studies (18, 19). In our study, in line with previous studies, the upper oesophagus was the most common site of FB obstruction (20). However, this study revealed that, contrary to the literature, female gender was dominant in OFBs.

Sharp objects, mainly fish or chicken bones, were the most common obstructing FBs (1, 9). Also, one-third of the general adult population is edentulous and has removable dentures, a well-known predisposing condition for recurrent FB impaction (21). Retrosternal pain was the most commonly reported symptom, and accompanying respiratory symptoms were present in approximately 4% of cases. The pulmonary symptoms result from compression of the trachea, progression of inflammatory processes in the oesophagus to the larynx and trachea, perforation and aspiration to the left main bronchus due to ulceration in the oesophagus (9). Our findings are consistent with the literature results, and most patients are diagnosed with sharp-edged objects. In addition, non-bone FBs and chest pain were detected more frequently in the thoracic oesophagus, while bone FBs and dysphagia were commonly seen in the cervical oesophagus.

Radiological procedures are essential in determining the presence, location and type of FB and therefore help us determine the most appropriate treatment approach. All cases with suspected OFB are evaluated with posteroanterior lung radiography, bilateral cervical

radiography, and, if necessary, direct abdominal radiography (22). FBs, such as bone, are usually seen in the hypopharynx and cervical oesophagus on cervical radiographs. Fish bones and wood chips may not be visible on the plain radiograph. The absence of FB on radiographs does not exclude FB. Contrast-enhanced radiographs can be taken in cases where no FB can be seen radiographically. If perforation is suspected, water-soluble contrast agents should be used (23). Computed tomography should be used as an advanced examination in patients whose FB cannot be detected despite all the tests or complications such as perforation and mediastinitis due to FB are suspected. In this study, the primary radiological imaging tool was plain radiography, and there was no difference between the study groups according to the primary radiological imaging tool.

Most ingested foreign bodies pass through the gastrointestinal tract without any difficulty. Spontaneous passage can mostly be expected within 4–6 days (24). In rare cases this may take up to 4 weeks. Until the foreign body has passed through the patient's body safely, the patient's stools should be continuously observed (9). If a FB get stuck, it should be removed quickly and, if possible, visually to relieve the patient and prevent possible complications. The best treatment method for the removal of FBs is controversial. It should be decided whether intervention is required for FB obstruction, its urgency and the most appropriate intervention. The treatment option depends on many factors, such as the patient's age, clinical condition, size and sharpness of the FB, anatomical localisation, and the physician's experience (23). While endoscopy is an essential method in treating FBs stuck in the oesophagus (25), according to recent studies, almost all FBs can be removed with a success rate of 98% with rigid esophagoscopy (26). Complications can be seen at a rate of 1-5% during the removal of OFBs or in prolonged cases (27).

In the present study, the complication rate was 4.6%, which was in the literature range, and 3 of 9 patients required additional intervention (thoracotomy or tracheostomy). Additional to the literature data, the rate of further intervention (9.1% vs 0.6%) and morbidity (18.2% v 2.9%) were higher in thoracic FBs. As a result of these preponderances, hospital stays were longer in the thoracic FBs.

## CONCLUSION

This was the first comparative literature study about the clinical differences and outcomes between FBs in adults' cervical and thoracic oesophagus. The most common obstruction side was the cervical oesophagus, the first narrowing of the oesophagus. According to the present study, non-bone FBs and chest pain were detected more frequently in the thoracic oesophagus, and dysphagia





was common in FBs in the cervical oesophagus. Length of hospital stay, morbidity rate, and additional surgical intervention was common in patients with a FB in the thoracic oesophagus.

## ETHICAL DECLARATIONS

**Ethics Committee Approval:** The study protocol was approved by the Van Yuzuncu Yil University Faculty of Medicine Non-interventional Clinical Researches Ethics Committee (Date: 19.02.2021, Decision No: 2021/03-13).

**Informed Consent:** Because the study was designed retrospectively, no written informed consent form was obtained from patients.

**Referee Evaluation Process:** Externally peer-reviewed.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

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