

Early and Late Findings and Treatments of Foreign Body Aspirations in Adults

Erişkinlerde Yabancı Cisim Aspirasyonlarının Erken ve Geç Dönem Bulgu ve Tedavileri

 Mehmet Değirmenci

Department of Thoracic Surgery, Kahramanmaraş Sütçü İmam University Faculty of Medicine, Kahramanmaraş, Türkiye
Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi, Göğüs Cerrahisi Anabilim Dalı, Kahramanmaraş, Türkiye

ABSTRACT

Objectives: This study aims to determine the early and late treatment, morbidity, and mortality of foreign body aspiration (FBA).

Methods: The retrospectively analyzed FBA cases admitted to the thoracic surgery clinic. The patients were evaluated clinically and radiologically. Fiber optic or rigid bronchoscopy was used for diagnosis and treatment. Thoracotomy was performed when necessary.

Results: Of the 23 patients evaluated, 15 (65.21%) were male. The mean age was 38.30±16.60. Of the patients, 17 (73.91%) were admitted early, and 6 (26.09%) in the late period. Twelve (52.17%) patients had risk factors. Risk factors were higher in patients admitted later than in the early period ($p=0.014$). Medical treatment was sufficient in four patients. The foreign body (FB) was removed by fiber optic bronchoscopy in three patients, rigid bronchoscopy in ten patients, and thoracotomy in six patients. The thoracotomy rate in patients who came to the hospital late was higher than in those who came in the early period ($p=0.001$). The most common localization was the trachea and right bronchial system, and the most common FB was a pin. Complications developed in 7 (30.43%) patients. The complication rate was higher in patients admitted in the late period ($p<0.001$). No mortality was observed.

Conclusion: Unnoticed foreign bodies in adults can lead to severe complications in the long term. Relatives of patients with risk factors should be careful about FBA and immediately apply to a health institution in case of suspicion of aspiration.

Keywords: Adults, aspiration, bronchoscopy, foreign bodies, thoracotomy

ÖZ

Amaç: Bu çalışmanın amacı, yabancı cisim aspirasyonlarının erken ve geç dönem tedavi, morbidite ve mortalitesini değerlendirmektir.

Yöntem: Ekim 2006 ile Ekim 2021 tarihleri arasında göğüs cerrahisi kliniğine başvuran yabancı cisim aspirasyonu olguları retrospektif olarak incelendi. Hastalar klinik ve radyolojik olarak değerlendirildi. Tanı ve tedavi amacıyla fiberoptik veya rijit bronkoskopi uygulandı. Gereğinde torakotomi yapıldı.

Bulgular: Yaş ortalaması 38,30±16,60 yıl olan 23 hastanın 15'i (%65,21) erkek idi. Hastalardan 17'si (%73,91) erken dönemde, 6'sı (%26,09) geç dönemde başvurdu. Hastalardan 12'sinde (%52,17) risk faktörü vardı. Geç dönemde gelen hastalarda risk faktörü bulunma oranı erken dönemde gelenlere göre daha fazla idi ($p=0,014$). Hastalardan dördüne medikal tedavi uygulanırken, üç hastada yabancı cisim fiberoptik bronkoskopiyle, 10 hastada rijit bronkoskopiyle, altı hastada ise torakotomiyle çıkarıldı. Geç başvuruda bulunanlarda torakotomi ihtiyacı erken başvuranlara göre fazlaydı ($p=0,001$). En sık yerleşim yeri trakea ve sağ bronşiyal sistem, en sık rastlanan yabancı cisim toplu iğne idi. Hastaların 7'sinde (%30,43) komplikasyon gelişti. Geç dönemde başvuran hastalarda komplikasyon oranı daha fazlaydı ($p<0,001$). Mortalite görülmedi.

Sonuç: Erişkinlerde fark edilmeyen yabancı cisimler uzun dönemde ciddi komplikasyonlara yol açar. Risk faktörü taşıyan hastaların yakınları yabancı cisim aspirasyonu konusunda dikkatli olmalı ve aspirasyon şüphesi durumunda hemen bir sağlık kuruluşuna başvurmalıdır.

Anahtar sözcükler: Erişkinler, aspirasyon, bronkoskopi, yabancı cisimler, torakotomi

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Address for correspondence: Mehmet Değirmenci, MD. Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi, Göğüs Cerrahisi Anabilim Dalı, Kahramanmaraş, Türkiye

Phone: +90 344 300 34 34/3395 **E-mail:** mehmetdegirmenci@ksu.edu.tr

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Introduction

Accidental entry of an object that should not be in the respiratory tract is defined as foreign body aspiration (FBA).^[1] Although most cases are concentrated in childhood, especially around 1–3 years of age, only a quarter of them is seen in adults.^[2] Its incidence in adults is around 6.6 per 1.000.000.^[1]

A foreign body (FB) may cause sudden death by completely obstructing the trachea or causing laryngospasm,^[3,4] or it may lead to mortality and morbidity by causing complications or chronic diseases in the long term.^[5,6] Although studies have been conducted on the early findings of FBA, there are few studies on late results and complications.

This study aims to determine the early and late treatment, morbidity, and mortality of FBA by evaluating acute and chronic FBA.

Methods

Ethical approval was obtained for our study. This study retrospectively evaluated laryngo-tracheo-bronchial FBA patients hospitalized between October 2006 and October 2021. Witnessed or clinically or pathologically detected FBAs were included in the study. Patients suspected of having FBA, but the presence of FB could not be proven, were excluded from the study. Patients aged 18 years and older were included in the study. Children were excluded from the study.

Anamnesis of the patients was taken, physical was examined, and bilateral chest radiographs and, if necessary, thorax computed tomography (CT) were taken. Medical treatment, fiber optic bronchoscopy (FOB), rigid bronchoscopy, or thoracotomy were applied to patients diagnosed with FBA, depending on the aspirated material and the patient's condition. Cardiac rhythm and oxygen saturation were monitored in all patients during the FOB procedure. The patients were sedated with intravenous midazolam (0.05–0.10 mg/kg). The pharyngolaryngeal region was locally anesthetized with lidocaine spray, and FOB was administered orally. Rigid bronchoscopy was performed under general anesthesia. An anesthesiologist performed the inhaler general anesthesia procedure through a rigid bronchoscope. If necessary, thoracotomy was performed in patients who could not be removed by bronchoscopic methods or presented with late complications. If necessary, prednisolone against the possibility of laryngospasm and antibiotics was administered. The patients were observed in the hospital for at least one day, nasal oxygen and cold steam were issued, and they were followed up in the intensive care unit when necessary.

The patient data were obtained from the medical records and analyzed by transferring them to the computer environment. Statistical data analysis was performed using the

SPSS 22.0 (SPSS, Inc.; Chicago, USA) program. The descriptive data were expressed as the statistical ratio (%) and frequency (n). Number (n) and percentage were calculated to summarize categorical measurements, mean and standard deviation were calculated for continuous measurements with a normal distribution, and median and minimum-maximum values were calculated for non-normally distributed variables. Chi-square or Fisher's exact test was used to compare group differences. $P < 0.05$ and 95% confidence interval were accepted as statistical significance values.

Results

The mean age of 23 patients between 18 and 77 years was 38.30 ± 16.60 . In addition, 15 (65.22%) patients were male, and 8 (34.78%) were female. The demographic and characteristic features of the patients are shown in Table 1.

Seventeen (73.91%) of the patients applied in the first 3 h in the early period, and 6 (26.09%) in the late period between 5 days and 3 months. The patients who presented in the early period had coughing attacks, choking, and cyanosis, while those who gave late had a chronic cough, shortness of breath, and sputum symptoms. The most common physical examination finding was decreased breath sounds in 12 (52.17%) patients. While 9 (39.13%) patients had normal radiological findings, FB was seen directly in 8 (34.78%) patients. In Figure 1, an aspirated pin is seen on the lateral chest radiograph. Radiologic findings of complications were observed in 6 (23.07%) patients who presented in the late period.

Twelve patients (52.17%) had risk factors (Table 1). The most common risk factor was laryngectomy+tracheostomy in four patients. Three were substance addicts. Other risk factors and comorbidities were achalasia, hypertension+diabetes mellitus, mental retardation+epilepsy, multiple sclerosis, and acute tonsillitis with dysphagia. The rate of risk factors in patients in the late period was higher than in those admitted early ($p=0.014$).

In 3 (13.04%) patients, FB spontaneously emerged during a coughing attack in the operating room. These patients received medical treatment. In addition, repetitive nasotracheal aspiration was performed in one patient with a history of food aspiration, and food residues were removed. A total of 7 (30.43%) patients underwent FOB. FOB failed in four patients, FB was removed with rigid bronchoscopy in three of these patients, could not also be removed with rigid bronchoscopy in one patient, and thoracotomy was performed in this patient who aspirated a pin. Thus, 11 (47.82%) patients underwent rigid bronchoscopy, which was successful in ten of them. The FOB failure rate was 57.14%, while the rigid bronchoscope failure rate was 9.09%. Thoracotomy was performed in 6 (26.01%) patients; in 5 (21.7%) patients who presented in the late period due to complications such

Table 1. Characteristic features of patients presenting in the early and late stages

	Early		Late		Total	
	n	%	n	%	n	%
Age (mean±SD)/years	41.0±18.3		30.6±6.3		38.3±16.6	
Gender						
Male	9	39.1	6	26.1	15	65.2
Female	8	34.8	0	0	8	34.8
Physical examination						
Finding +	8	34.8	6	26.1	14	60.9
Finding -	9	9.1	0	0	9	39.1
Radiology						
Finding +	8	34.8	6	26.1	14	60.9
Finding -	9	39.1	0	0	9	39.1
Risk factor						
+	6	26.1	6	26.1	12	52.2
-	11	47.8	0	0	11	47.8
Treatment methods						
Medical	3	13.0	1	4.4	4	17.4
FOB	3	13.0	0	0	3	3.0
RB	10	43.5	0	0	10	43.5
Thoracotomy	1	4.4	5	21.7	6	26.1
Localizations						
Trachea	10	43.5	0	0	10	43.5
Right	5	21.7	5	21.7	10	43.5
Left	2	8.7	1	4.3	3	13.0
Type of Foreign body						
Organic	7	30.5	3	13.0	10	43.5
Inorganic	10	43.5	3	13.0	13	56.5
Complication						
+	1	4.4	6	26.1	7	30.5
-	16	69.5	0	0	16	69.5
Hospital stays (mean±SD)/days	3.0±2.1		16.6±8.7		6.6±7.6	
Total	17	76,9	6	23,1	23	100

FOB: Fiber optic bronchoscopy; RB: Rigid bronchoscopy; SD: Standard deviation.

as lung abscess, empyema, and necrosis; and in 1 (4.4%) patient who applied in the early period for the removal of FB. The need for thoracotomy was significantly higher for late admission than early admission ($p=0.001$). The successful treatment modalities are given in Table 1.

The locations of FBs in the respiratory tract are given in Table 1. A pin was the most common FB detected in 3 (11.53%) patients. Nails, pills, sand, pomegranate seeds, chickpeas, and food were removed from two patients each. Meat, stool, carrot, bone, part of a speech device, ear stick, glue, and plastic keychain piece were detected in one patient each. There was no significant difference between the early and late admitted patients in the FB type.

Complications developed in 7 (30.43%) patients, including empyema in three patients, lung abscess in two patients, aspiration pneumonia in one patient, and laryngeal spasm

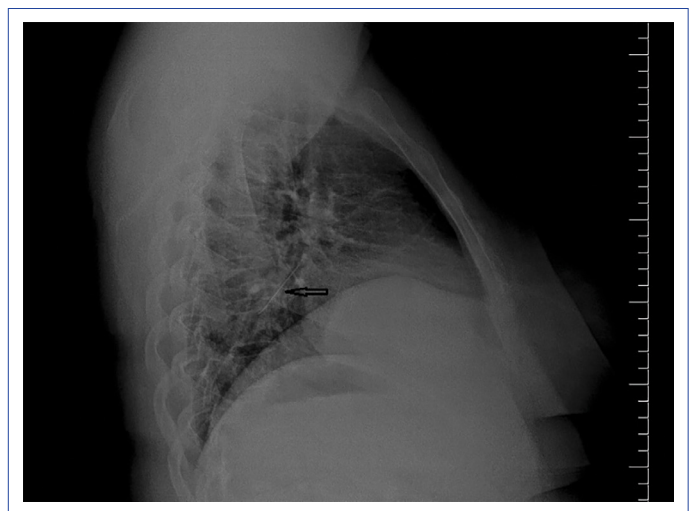


Figure 1. Lateral chest X-ray image of a pin aspiration case.

in one patient. The risk of complications was higher in patients admitted in the late period ($p < 0.001$). Seven (30.43%) patients were admitted to the intensive care unit. One of them was in the early stage, and six of them were in the late stage. The rate of admission to the intensive care unit was higher in patients admitted to the hospital in the late period ($p < 0.001$). A mechanical ventilator was needed in 4 (15.38%) patients; three patients were admitted late and one early. No mortality was observed.

The hospitalization period ranged from 1 to 9 days in the early period and 7–28 days in the late period. The mean length of stay in the hospital is given in Table 1. When we analyzed this by grouping the hospitalization durations as shorter and longer than the mean of 6.61 days, it was found that the hospital stay was significantly longer in patients admitted in the late period than in those in the early period ($p < 0.001$).

Discussion

FBA is typical in infants and children due to deficiencies in teeth, incomplete swallowing function, the reflex to take objects to the mouth, and crying and speaking characteristics while eating.^[7,8] Although FBA is less common in adult patients, there is usually an underlying risk factor. Risk factors may include neuromuscular disorders, psychiatric disorders, tracheostomy cannula or voice prosthesis use, mental changes, poisoning, iatrogenic causes, and alcohol and drug addiction.^[1,9] Despite this, FBA can be seen in 10% of adults without any risk factor.^[4] In our study, all patients presenting late had an underlying risk factor. The most common risk factor was tracheostomy due to laryngectomy. These patients had aspirated the objects that they used to clean the trachea or the tracheostomy cannula. Three patients who used inhalers under unhealthy conditions did not remember the substance aspiration after sleeping in unhealthy conditions after taking the substance. Neuromuscular disorders were risk factors in two patients and enlarged tonsillitis in one patient. Patients with risk factors should have someone with them while they eat, and patients with tracheostomy should remove and clean their tracheostomy cannulas under appropriate conditions. Combating substance abuse will prevent many substance-related complications as well as possible FBA.

In general, FBA is more common in males.^[10,11] However, in countries where the religion of Islam is widespread, the ratios of women and men are close to each other, because women aspirate the headscarf needle.^[6] In our study, the rate in men was higher. This rate was attributed to the risk factors in the men.

Cough, decreased breath sounds, and wheezing constitute the classic triad in patients presenting in the early period.^[7,10] Patients may present with complications or chronic diseases in the late period.^[8,11] FBA was revealed in the pathol-

ogy report or when anamnesis is detailed in some patients presenting late. Therefore, FBA should also be considered in patients with a persistent cough or recurrent pneumonia.^[12]

After history and physical examination, patients should undergo a two-sided chest X-ray to confirm the diagnosis.^[13] However, normal appearance on chest X-ray has been reported in 23–42%.^[7,8] Conversely, FB can be seen directly at approximately 25–44%.^[3,9] The most common indirect radiological finding is unilateral air trapping or hyperaeration.^[14] In this study, while the chest X-ray was normal in 39.13% of the patients, FB was directly visualized in 34.78%. These rates are consistent with those of previous studies. In addition, findings of complications were observed in patients who presented in the late period. CT is more sensitive than chest X-rays.^[5,15] However, high-dose radiation to be given during CT scans, especially in children, should also be considered. CT helped demonstrate some FBs or complications not visible on chest X-rays in our series.

Since the right main bronchus is broader and vertical than the left, FBs most frequently go to the right bronchial system.^[2,13] The most common location of FBs in our series was the right side and trachea. The reason for tracheal localization may be the rapid arrival of adult patients to the hospital. FB is generally classified as organic and inorganic.^[9] In the literature, the most frequently aspirated FBs are reported as organic materials, especially nuts.^[10,15] However, in Islamic countries, including our country, the most common type of FB is a headscarf pin in adults.^[4,6] Although the most common FB was the headscarf pin, organic substances were detected more in our patients, consistent with the literature.

The standard treatment in FBA is bronchoscopy, which is based on the endoscopic evaluation of the tracheobronchial system.^[14,16] Rigid bronchoscopy was the first to be used.^[12] However, with the introduction of FOB recently, it has begun replacing rigid bronchoscopy.^[12,17] The advantages of FOB are ease of use, widespread availability, better visualization of the distal airways, and no need for general anesthesia. However, providing airway patency with rigid bronchoscopy, a broader working channel, and the use of rigid forceps of various sizes and features for FB removal are significant advantages.^[18] While rigid bronchoscopy is considered the most appropriate method in pediatric patients,^[17,18] the choice of bronchoscopy in adults is still controversial. FOB success rate has been reported as 45%–90%,^[5,17] and the rigid bronchoscopy success rate is up to 100%.^[18] The success rate was 42.86% for FOB and 90.90% for rigid bronchoscopy in our study. It is more appropriate to perform FBA treatment in centers with rigid bronchoscopy and to apply FOB in selected patients. FBs cannot be removed by bronchoscopy in 0.4–34% of patients, and surgery is required.^[11] In 1 (5%) of the patients in our series, thoracotomy was

performed, because bronchoscopy was unsuccessful. In addition, five patients (21.73%) admitted in the late period underwent thoracotomy due to complications.

Emergency complications, such as laryngospasm, intraoral injury, pneumothorax, pneumomediastinum, laryngotracheobronchial injury, cardiac complications, and death, may occur depending on FB or the procedure performed during its removal.^[16] Laryngeal edema and respiratory arrest developed after a pill aspiration in a tonsillitis patient. The patient was resuscitated in the operating room and was connected to a mechanical ventilator. A missed FBA may cause complications such as hemoptysis, atelectasis, pneumonia, lung abscess, bronchiectasis, granuloma, and pneumothorax in the late period.^[2,16] Complications have been reported at a rate of 22–23% in FBA cases.^[13] In our series, 6 (26.08%) patients presented with complications such as pneumonia, lung abscess, and empyema in the late period. Complications and complication rates were consistent with the literature. In recent studies, mortality rates have been reported to be between 0% and 8.3%.^[15] No mortality was observed in our study. Patients admitted early were generally discharged within 1–3 days, consistent with the literature.^[11] However, hospitalization times were significantly longer for patients presenting with complications. Since the thoracotomy rate was higher in patients with complications, the hospital stay was longer.

Conclusion

Although FBA may cause acute respiratory failure in the early period, unrecognized FBA in adults can lead to severe complications in the long term, and its treatment is challenging. For this reason, especially in patients with risk factors, the relatives of the patients to be careful about FBA and to apply to the health institution immediately in suspicious cases will reduce the possible morbidity and mortality.

Disclosures

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References

- Kök A. Foreign body aspiration. *Updates Pulm Dis* 2018;6:101–11.
- Hewlett JC, Rickman OB, Lentz RJ, Prakash UB, Maldonado F. Foreign body aspiration in adult airways: Therapeutic approach. *J Thorac Dis* 2017;9:3398–409.
- Çobanoğlu U, Yalçınkaya İ. Tracheobronchial foreign body aspirations. *Turk J Trauma Emerg Surg* 2009;15:493–9.
- Liman ŞT, Eliçora A, Topçu S. Foreign body aspirations and esophageal foreign bodies. *Bull Thorac Surg [Article in Turkish]* 2012;3:94–103.
- Chousein EGU, Tanrıverdi E, Turan D, Yıldırım BZ, Yılmaz Ş, Chousein İ, et al. Management of adults with suspected foreign body aspiration. *Dicle Med J* 2021;48:99–107.
- Özdemir C, Sökücü SN, Karasulu L, Büyükkale S, Dalar L. Foreign body aspiration in adult: Analysis of 28 cases. *Eurasian J Pulmonol* 2015;17:29–34.
- Avcı A, Özden O, Hatipoğlu Z, Onat S. Urgent bronchoscopy for foreign body aspiration: 48 children among 1096 patients. *Acta Medica* 2019;50:38–43.
- Karakaya AE, Güler AG, Doğan AB, Ural DA, Arslan S. The danger close to home: Foreign body aspiration in the children, prevention, diagnosis and treatment evaluation. *KSU Med J* 2021;16:149–53.
- Alrais ZF, Shoab MI, ElKholi HM, Alsabbah A. Foreign body aspiration in adult, what would you expect? Case report. *Int J Case Reports* 2019;4:101.
- Chouhan M, Sharma S. Tracheobronchial foreign bodies: The importance of timely intervention and appropriate collaboration. *Indian J Otolaryngol Head Neck Surg* 2019;71(Suppl 1):972–5.
- Turla A, Aydın B, Kocakaya M. Foreign body aspirations which do not result in death. *Bull Leg Med* 2006;11:13–8.
- Bajaj D, Sachdeva A, Deepak D. Foreign body aspiration. *J Thorac Dis* 2021;13:5159–75.
- Erol MM. Current approach for trachea bronchial foreign body aspirations. *Selcuk Med J* 2011;28:201–4.
- Fasseeh NA, Elagamy OA, Gaafar AH, Reyad HM, Abougabal MS, Heiba DA, et al. A new scoring system and clinical algorithm for the management of suspected foreign body aspiration in children: A retrospective cohort study. *Ital J Pediatr* 2021;47:194.
- Mohsen F, Bakkar B, Melhem S, Altom R, Sawaf B, Alkhija I, et al. Foreign body aspiration in a tertiary Syrian centre: A 7-year retrospective study. *Heliyon* 2021;7:e06537.
- İlçe Z. Tracheobronchial foreign body aspiration in children. *Kocaeli Med J [Article in Turkish]* 2012;1:47–54.
- Sehgal IS, Dhoria S, Ram B, Singh N, Aggarwal AN, Gupta D, et al. Foreign body inhalation in the adult population: Experience of 25,998 bronchoscopies and systematic review of the literature. *Respir Care* 2015;60:1438–48.
- Ng J, Kim S, Chang B, Lee K, Um SW, Kim H, et al. Clinical features and treatment outcomes of airway foreign body aspiration in adults. *J Thorac Dis* 2019;11:1056–64.