



Management of Adults With Suspected Foreign Body Aspiration

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Abstract

Objective: Although foreign body aspiration (FBA) in adulthood is not as common as in childhood, it can sometimes be encountered with clinical situations that require urgent interventions. Removal of foreign bodies (FBs) is crucial in all cases of aspiration, even if they seem trivial and symptoms have resolved. Unremoved FBs cause chronic lung pathologies such as postobstructive pneumonia, bronchiectasis, atelectasis and scar formation which can be definitely treated only by FB removal. The treatment of choice is either fiberoptic or rigid bronchoscopy.

The aim of our study was to create an algorithm for the management of patients presenting to our bronchology and interventional pulmonology unit with suspected FBA by reviewing their radiologic findings, the bronchoscopic methods used in their management and outcomes.

Methods: We retrospectively reviewed the medical records of 70 patients who underwent fiberoptic bronchoscopy (FOB) and rigid bronchoscopy (RB) for suspected FBA in our bronchology and interventional pulmonology center between January 2010 and December 2019.

Results: There were 70 patients with suspected FBA, who had an average age of 47.22±20.76 years, and 62.8% were males. Twenty-nine (41.4%) were treated with FOB and 25 (35.7%) with RB. A FB was detected initially by FOB in 16 (22.9%) who subsequently had to undergo RB for FB removal. Fifteen (33.3%) FOB and 9 (21.9%) RB procedures were performed on an emergent basis.

A total of 86 bronchoscopic treatments were performed on 70 patients. FBs were detected with FOB in 29 patients. The FB was removed in 13 (28.8%) patients with the help of FOB, while 16 (35.5%) patients in whom FB removal was not possible were referred to the interventional pulmonology unit for RB. In the remaining 16 (35.5%) patients, no FB was found during FOB. A total of 41 patients were treated with RB, including 16 patients who had initially undergone FOB. FB was detected and removed in 38 (92.6%) patients, 2 (4.8%) patients had no FB detected and received no further treatment after being consulted with thoracic surgery. One (2.4%) patient in whom FB was detected but could not be removed was referred to surgery and was operated.

Rates of FB detection were high for both chest x-ray and unenhanced thoracic computerized tomography (CT) in favor of CT (p=0.038 and 0.022 respectively). Thirty-three (58.9%) of the FB removed were in the right bronchial system and composition of FBs (organic or inorganic) was equal.

Conclusion: When thoracic CT is not available chest x-ray can also be helpful in cases of suspected FBA. Because the possibility of FBA should be considered in many chronic pulmonary conditions, physicians choose FOB for their initial evaluation, especially if transfer to an interventional pulmonology unit is not feasible. RB performed by interventional pulmonologists is a safe therapeutic option in critical patients and cases when FOB fails.

Keyword: Suspected foreign body aspiration, adult, bronchoscopic procedures.

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Erişkin Yabancı Cisim Aspirasyon Şüpheli Olguların Yönetimi

Öz

Amaç: Erişkinlik çağında çocukluk çağındaki kadar sık rastlanmasa da erişkinlerde de bazen acil müdahale gerektirecek tablolarla yabancı cisim aspirasyonları (YCA) karşımıza çıkabilmektedir. Semptomlar kaybolursa, önemsiz görünseler de YC'lerin tüm aspirasyon vakalarında çıkarılması çok önemlidir çünkü çıkarılmamış YC'ler, postobstrüktif pnömoni, bronşektazi, atelettazi ve skar oluşumu gibi kronik akciğer patolojilerine neden olabilir. Terapötik yaklaşımda ilk tercih fiberoptik ya da rijid bronkoskopik uygulamalardır.

Çalışmamızın amacı YCA şüphesi ile bronkoloji ve girişimsel pulmonoloji birimimizde işlem uygulanan hastaların radyolojik bulgularını, tedavide kullanılan bronkoskopik yöntemleri ve sonuçlarını gözden geçirilerek bu hastaların yönetimine yönelik bir algoritma oluşturmaktır.

Yöntemler: Bronkoloji ve girişimsel pulmonoloji merkezimizde Ocak 2010 ile Aralık 2019 tarihleri arasında YCA şüphesi nedeniyle fiberoptik bronkoskopi (FOB) ve rijid bronkoskopi (RB) yapılan 70 hastanın tıbbi kayıtlarını geriye dönük olarak incelendi.

Bulgular: Ortalama yaşları 47.22 ± 20.76 yıl olan ve % 62.8'i erkek olan 70 YCA şüphesi olan hasta değerlendirildi. Yirmi dokuzu (% 41.4) FOB ile, 25 (% 35.7)'i RB ile tedavi edilmişti. 16 (%22.9) hastada ise FOB ile YC saptanmış ancak çıkarılamayınca RB'ye geçilmişti. FOB uygulanan olguların 15 (%33.3)'i, RB uygulananların ise 9 (%21.9)'u işleme acil olarak alınmıştı.

70 hastaya toplam 86 bronkoskopik tedavi uygulanmıştı. 29 hastada FOB ile FB'ler tespit edilmişti. 13 (% 28,8) hastada FOB yardımı ile YC çıkarılabilirken, çıkarılması mümkün olmayan 16 (% 35,5) hasta RB için girişimsel pulmonoloji ünitesine refere edilmişti. Geri kalan 16(%35.5) hastada ise FOB'de yabancı cisime rastlanmamıştı.

Başlangıçta FOB uygulanan 16 hasta dahil toplam 41 hasta RB ile tedavi edilmişti. RB ile 38(%92.6) hastada YC saptanmış ve çıkarılabilmiş, 2(%4.8) hastada YC saptanamayarak, göğüs cerrahisi ile konsültasyon sonrası hastalar takipe alınmıştı. Bir (%2.4) hastada ise RB ile YC çıkarılamamış göğüs cerrahisine refere edilmiş ve opere olmuştu.

YC saptama oranları toraks bilgisayarlı tomografide (BT) daha yüksek olmakla beraber hem akciğer grafisi hem de kontrastsız toraks BT'de yüksekti (sırasıyla $p = 0.038$ ve 0.022). Çıkarılan YC'in 33 (% 58.9)'ü sağ bronşiyal sistemdeydi ve YC'lerin bileşimi (organik veya inorganik) eşitti.

Sonuç: YCA şüphesinde toraks BT'ye ulaşım imkanı olmayan durumlarda akciğer grafisi de yol gösterici olabilir. Birçok kronik pulmoner patolojide YCA olasılığının göz önünde bulundurulması gerektiğinden, hekimler, özellikle bir girişimsel pulmonoloji ünitesine transfer mümkün değilse, ön değerlendirme amaçlı FOB'yi seçebilirler. Girişimsel pulmonologlar tarafından gerçekleştirilen RB, kritik hastalarda ve FOB'nin başarısız olduğu durumlarda güvenli bir tedavi seçeneğidir.

Anahtar kelimeler: Yabancı cisim aspirasyonu şüphesi, erişkin, bronkoskopik işlemler.

INTRODUCTION

Foreign body aspiration (FBA) is a common and potentially fatal emergency in children¹. While FBA in children is usually an accidental event, it is ranked lower among life-threatening accidental emergencies in adults². In addition to acutely emergent presentations, FBA in adults can present with a history of aspiration, or as part of the differential diagnosis of symptoms such as persistent cough and dyspnea. Therefore a high index of suspicion for FBA is required when evaluating patients with clinical or radiological findings related to chronic pulmonary conditions such as recurrent lower respiratory tract infections, postobstructive pneumonia, localized bronchiectasis, atelectasia and scar formation. The detection and removal of a foreign body (FB) can provide a solution to an acute situation or chronic process. The treatment of choice in FBA is

removal by a bronchoscopic approach. For this purpose both fiberoptic and rigid bronchoscopy are used, each having its own advantages and disadvantages^{2,3}.

The aim of this study was to create an algorithm for the management of patients with suspected FBA by reviewing patients' clinical and radiologic findings, the type of bronchoscopy and auxiliary equipment utilized and patients' outcomes.

METHODS

Study Population

A total of 70 patients who underwent fiberoptic bronchoscopy (FOB) and/or rigid bronchoscopy (RB) in our bronchology and interventional pulmonology unit, which is a referral center, between January 2010 and December 2019 for suspected FBA were included in our study. The computerized

records of our bronchology and interventional pulmonology units were reviewed for the demographic data of patients, admission symptoms and their urgency status, comorbidities, radiological findings, chosen bronchoscopy procedure and technique, characteristics of the removed foreign body, its localization, and outcomes.

In accordance with the Helsinki Declaration and the general practice of our hospital, written and oral approval consent was obtained from the patients. Our study was approved by the University of Health Sciences Turkey, Yedikule Thoracic Diseases and Thoracic Surgery Training and Research Hospital Science Board (22.01.2020 / 237-2) and University of Health Sciences Turkey, Hamidiye Medical Faculty Ethics Committee (24.01.2020/ 20/127/ 46418926-050.03.04).

Fiberoptic Bronchoscopy

FOB procedures were performed under conscious sedation. All patients were monitored with electrocardiography and SpO₂ during the procedure. Intravenous midazolam 0.05-0.10 mg/kg and local lidocaine (maximum dose 8mg/kg) were used and dosages were adjusted to the patient's condition. Fiberoptic bronchoscopes (Olympus, Medical Co., Tokyo, Japan/ Pentax, Medical Co., Akishima-shi, Tokyo, Japan/ Fujifilm, Ashigara, Japan) were inserted through the oral route.

Rigid Bronchoscopy

RB procedures were performed under general anesthesia. All patients were monitored with electrocardiography and SpO₂ during the procedure. General anesthesia induction was achieved with midazolam 0.05- 0.10 mg/kg, diprivan (maximum dose 1000 mg), remifentanil (maximum dose 2 mg), and rocuronium (maximum dose 50 mg), the dosage adjusted to the patient's condition. The equipment used in the procedures included the Dumon Series II rigid bronchoscopes (Efer

Endoscopy, La Ciotat, France) with optical system. APC (40 W, blended mode/continuous flow) was applied using an instrument by ERBE Elektromedizin GmbH, (Tubigen, Germany). Endoluminal treatment was accomplished with a diode laser operating at a wavelength of 980 nm with 4 to 25 W in pulsed mode (Biolitec Cerals D25; Germany). Cryo-therapy was performed with the ERBOKRYO system (Elektromedizin GmbH, Tübingen, Germany).

Statistical Analysis

Statistical analyses of the data were performed by using SPSS (Statistical Package for the Social Sciences, Chicago, IL, USA) R software version 20.0 package program for statistical analysis. Shapiro Wilk test was used to calculate normal distribution. Chi-square test was used to compare categorical variables. Values with a P value of 0.05 and below were considered statistically significant.

RESULTS

There were 70 patients, 44/70 (62.8%) were male and had a mean age of 47.22±20.76 years. Twenty-nine patients underwent FOB, 25 underwent RB and 16 patients were treated with RB following FOB (Table 1).

In 12 (17.1%) patients who were either asymptomatic or had not acute pulmonary symptoms suggestive of FBA during presentation, bronchoscopy was indicated because of chronic symptoms and/or radiological findings suggestive of previous FBA. The remaining 58 (82.9%) patients had ≥1 pulmonary symptom(s). The most common symptoms were shortness of breath in 33 (47.1%), cough in 30 (42.2%) and choking in 7 (10%) patients (Table 1). Predisposing factors for FBA were present in 9 (12.8%) patients with an artificial airway (7 (10%) patients with tracheostomy tubes and 2 (2.8%) with endotracheal tubes).

Table I: Characteristics of study population

Variables	Value
Number of patients (n)	70
Mean age (Years±SD)	47.22±20.76
Gender, male, n, (%)	44 (62.8)
Symptoms	
No [†] , n, %	12 (17.1)
Dispnoea, n, %	33 (47.1)
Cough, n, %	30 (42.2)
Chocking, n, %	7 (10.0)
Duration of symptoms before admission	
<3 days, n, %	34 (48.6)
(< 24 hours, n, %)	22 (31.4)
≥3 days, n, %	36 (51.4)
Comorbidities	
No, n, %	38 (54.3)
Pulmonary, n, %	14 (20.0)
Malignancy, n, %	11 (15.7)
Neurological disorders, n, %	7 (10.0)
Emergency of patients	
Emergent, n, %	22 (31.4)
Not emergent, n, %	48 (68.6)
Distribution of patients by procedure	
FOB, n, %	29 (41.4)
RB, n, %	25 (35.7)
FOB + RB, n, %	16 (22.9)
Number of procedures, n	86
FOB, n, %	45 (52.3)
RB, n, %	41 (47.7)

n: number, SD: standard deviation, †: Asymptomatic patients, referenced after the history / radiological findings were found that suggest foreign body while being examined for different reasons, FOB: Fiberoptic bronchoscopy, RB: Rigid bronchoscopy

Thirty-eight (54.3%) patients did not have any known comorbidities. The most common comorbidities were chronic respiratory diseases such as bronchiectasis, asthma and chronic obstructive disease (COPD) in 14 patients (20%), malignancy in 11 (15.7%), and

neurological diseases in 7 (10%) patients (Table 1).

All patients had a chest x-ray before the procedure except for 1 patient who underwent FOB and RB following a needle breakage during endobronchial ultrasound (EBUS). Thirty patients (42.9%) had radiological findings suggestive of FBA such as opacity, atelectasis, localized bronchiectasis and hyperaeration. CT images were not available for review in 25 (35.7%) patients who had possibly received diagnostic imaging before referral to our center. Forty-four patients had a thoracic CT available for review, of whom 27 (60.0%) had radiological findings compatible with FBA such as opacity in the airway lumen, atelectasis, localized bronchiectasis or hyperaeration, and postobstructive pneumonia. The efficacy of chest x-ray and thoracic CT in detecting FB was statistically significant (p=0.038 and p=0.022 respectively) (Figure 1).

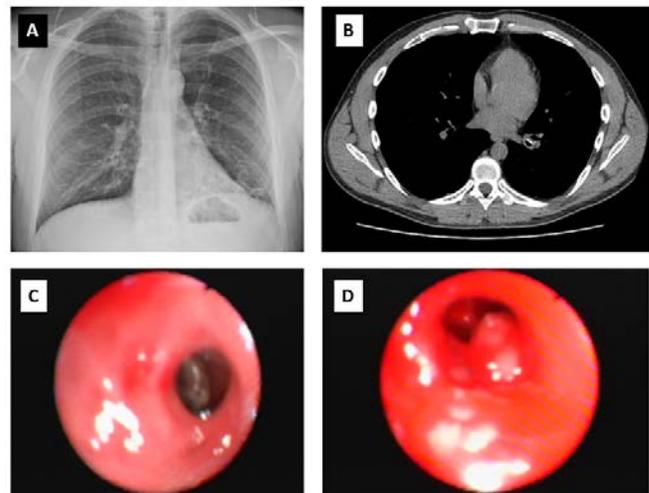


Figure 1: 36-year-old male patient with normal chest x-ray (A), thoracic computerized tomography demonstrating foreign body (FB) within left lower lobe (B), appearance of FB during rigid bronchoscopy (C), chronic granulation tissue formation at site of removed FB (D)

Thirty-three (58.9%) FB were detected and removed in the right bronchial system, 18 (32.1%) in the left bronchial system and 3 (5.3%) in the trachea. Twenty-three (45.0%) of

the removed FB were characterized as organic (mainly solid and semi-solid foods), 23 (45.0%) as inorganic and 5 (10.0%) remained unspecified after pathological examination. Inorganic FB were of metallic structure (such as pins, staples, screws) in 13 patients, and non-metallic objects (such as bottle cap, speech apparatus, dental prosthesis, napkin) in 10 patients (Table 3) (Figure 2).



Figure 2: Images of removed foreign body **A1:** Piece of garlic fully obliterating the left lower bronchus in a 61-year-old male patient during emergent rigid bronchoscopy **A2:** View of patent bronchus following foreign body removal with cryo-probe **B:** Broken biopsy needle lodged at carinal level during EBUS procedure in a 80-year-old patient which was removed by rigid bronchoscopy following fiberoptic bronchoscopy **C:** FOB view of medicine in tablet form in right main bronchus **D:** Entangled cotton threads detected in the right main bronchus in a 60-year-old woman with schizophrenia **E:** The final destination of foreign bodies (FB) removed out of the lungs: The FB display cabinet in our interventional pulmonology unit

FOB was able to detect FB in 29/45 patients, with FB removal being possible in 13 (28.8%). Sixteen (35.5%) patients in whom FOB was technically insufficient for FB removal were referred to the interventional pulmonology unit for RB. FB was not detected in the remaining 16 (35.5%) patients who received no additional treatment. A biopsy forceps was used during 15 (33.3%) and cryo-probes were used during 8 (17.7%) procedures with both being used in some cases (Table 2).

Forty-one patients underwent RB, including 16 patients who were referred following FOB. FB removal was successful in 38 (92.6%) patients, 2 patients had no detectable FB, and 1 patient had a

nonremovable FB and was subsequently operated by thoracic surgery. The most commonly used auxiliary equipment during BP was biopsy forceps in 34 procedures followed by cryo-probes in 11 and scissors in 6, each being used alone or in combination. The rate of FB removal by RB was statistically significantly higher than FOB ($p= 0.026$ and $p= 0.048$ respectively) (Table 2).

Table II: Radiological findings, rates of foreign body (FB) detection and removal, chosen bronchoscopic methods and equipment in patients with suspected FB aspiration

Variables	Value	P value
Chest x-ray, n	69	
FB finding present, n, %	30 (43.4)	
FB finding absent, n, %	39 (56.5)	0.038
Thorax CT, n	45 (65.2)	
FBF present, n, %	27 (60.0)	
FBF absent, n, %	18 (40.0)	0.022
Foreign body detection and removal		
Detected and removed, n, %	52 (74.3)	
Not detected, n, %	18 (25.7)	
FOB, n		
FB detected and removed, n, %	13 (28.8)	
FB detected and not removable, n, %	16 (35.5)	0.048
FB not detected, n, %	16 (35.5)	
RB, n		
FB detected and removed, n, %	38 (92.6)	
FB detected and not removed, n, %	1 (2.4)	0.026
FB not detected, n, %	2 (4.8)	
Bronchoscopic equipment		
FB, n	45	
Biopsy forceps, n, %	15 (33.3)	
Cryo-probe, n, %	8 (17.7)	
Basket, n, %	1 (2.2)	
RB, n	41	
Biopsy forceps, n, %	34 (82.9)	
Cryo-probe, n, %	11 (26.8)	
Basket, n, %	0 (0.00)	
Scissors, n, %	6 (14.6)	

n: Number, CT: Computerised tomography, FB: Foreign body, FOB: Fiberoptic bronchoscopy, RB: Rigid bronchoscopy,

Among 16 patients in whom FOB was not successful, 15 had chest x-ray findings and 12 had thoracic CT findings suggesting FBA. It was found that the structure of FB obtained by FOB were frequently unspecifiable whereas those removed with RB were inorganic objects (43.7%) (Table 3).

Table III: Localization and composition of removed foreign bodies

Variables	Value
Trachea, n, (%)	3 (5.3)
Right bronchial system, n, %	33 (58.9)
Main bronchus	7
Intermediate bronchus	5
Upper lobe	4
Middle lobe	3
Lower lobe	3
Left bronchial system, n, %	18 (32.1)
Main bronchus	9
Upper lobe	1
Lower lobe	8
Not removable	1 (2.4)
No FB detected	18 (25.7)
Organic FB*, n, %	23 (45.0)
Inorganic FB, n, %	23 (45.0)
Metallic d	13
Non Metallic ¥	10
Undefined FB, n, %	5 (10.0)

n: Number, FB: Foreign body, ж: Solid and semi-solid food, d: Scarf pins, fastener, etc..., ¥ :Plastic materials such as speaking apparatus, cologne cap, etc

There were 18 (25.7%) patients in whom FB was not detected by bronchoscopic procedures. Six of these patients had radiological findings compatible with suspected FBA, the remaining had symptoms compatible with suspected aspiration but their thoracic CT images were not available for reviewing.

In this study we found the rate of FB detection and removal by bronchoscopic methods in suspected cases to be 74.3% with no major complications related to FOB or RB in any patients.

DISCUSSION

FBA, being a potentially life-threatening event, is one of the most important emergencies in both childhood and adulthood^{1,3}.

FBA in childhood is generally an emergent accidental condition seen in a healthy child. The patient history and symptoms of acute FBA in adults differ from children. Presentation can vary from healthy-looking asymptomatic cases to patients with underlying facilitating factors such as neurological diseases causing swallowing dysfunction, or pulmonary diseases with a tracheostomy or a history of intubation. In our study of adult patients, 54.3% of the cases consisted of healthy individuals showing that FBA can present as an accidental emergency in healthy individuals. 31.4% of these cases needed emergent treatment and had presented to our emergency with severe life-threatening symptoms highly suggestive of FBA. FOB was preferred in the majority of patients who were treated urgently for FBA because it does not require general anesthesia, is relatively easier to prepare, it is more acceptable to patients and it can be performed by all pulmonologist in our center, which is a tertiary referral hospital^{2,4,5}.

Some cases of adulthood FBA are actually due to foreign bodies aspirated in childhood and were either unnoticed or underestimated. In these patients FBA is suspected due to clinical or radiological findings of chronic pulmonary

disease such as recurrent lower respiratory tract infections, postobstructive pneumonia, localized bronchiectasis, atelectasis. These patients may need to be evaluated by bronchoscopic methods for "suspected foreign body aspiration"^{2,4,5}.

Bronchoscopic removal of foreign bodies, in addition to being life-saving in an emergency, can also help resolve chronic pulmonary conditions and thus save patients from unnecessary surgical procedures. A rigid bronchoscope was used for the first foreign body removal in history and in most studies RB is considered the gold standard in the treatment of FBA. The advent and widespread use of FOB which is easier to learn and has high success rates, led to reconsidering the bronchoscopic method of choice in the management of FBA^{2,6-9}.

Shortness of breath was often prominent in our patients and 7 patients had a known choking and history. Acharya has reported a higher rate of history of known aspiration in his study. Cough was another common symptom in addition to hemoptysis, sputum expectoration and fever⁶.

Shegal et al have reported an overall success rate of 89.6% of FB removal with FOB. When the study findings are examined in detail, it is seen that FB was detected in 49 (75%) of the 65 suspected FBA cases and that 45 (69%) of them were removed. They report a higher success rate for FOB in FB removal than us. Patients in the study of Shegal et al included children 12-18 years old and had a known aspiration history of 60/65 (92%), while in our study patients with a similar history were 26/70 (37.6%). Among patients with suspected FBA we were able to detect FB in 29 (64%) patients and remove it in 13 (45%) patients. We did not detect a FB with FOB 16 patients. Five of these patients had pathological findings in chest x-ray and CT in line suggesting FBA, while the rest had symptoms suggesting FBA but we could not obtain their thoracic CT records. 51.4% of

patients in our study comprised patients with no symptoms of acute aspiration who were referred to our hospital because of radiological imaging findings suggesting FBA. The rate of patients referred to RB in our study is higher compared to other studies because of the availability of RB in our institution (Table 2). None of the patients undergoing FOB had a confirmed intra-bronchial FB as FOB was their initial procedure. However FB had already been detected with FOB in half of the patients who underwent RB, which was utilised only for the removal of FB. This partially accounts for the higher success rate of RB. RB is considered a technically effective method for removing FB. We were not able to remove the FB with RB in only 1 patient, similar to the study of Acharya et al⁶.

The success rate for FB detection and removal with FOB and RB was 45% and 92.6% respectively. There are many reasons accounting for this marked difference, including the ease of FOB procedures as initial evaluation, a previous confirmation of FB with FOB in a proportion of patients, the higher percentage of patients with a definite aspiration history among patients treated with RB, and the potential for combination of the two methods in facilitating treatment by using FOB through a rigid bronchoscope^{6,8,10}.

In a study where Özdemir et al reported an 89% success rate, only 1 of 28 patients had symptoms for more than 24 hours and had undergone bronchoscopy due to suspicious imaging findings. In our study there was a higher proportion of patients without a history of aspiration but having symptoms and radiological findings suggesting FBA. The lower rates of FB detection and removal in our study compared to the study by Özdemir et al may be explained by the higher percentage of chronic cases in our series¹¹.

All patients in the study were imaged with chest x-rays except for one patient who was treated

urgently due to needle rupture during endobronchial ultrasound (EBUS), with 30 (42.9%) of them having radiological findings suggesting FB such as opacity, hyper-aeration or atelectasis. CT images were not available for review in 25 (35.7%) patients who had undergone diagnostic imaging before referral to our center. Twenty-seven (39.1%) patients with thoracic CT images present in our electronic medical records had tomographic findings suggesting FB. In the study of Bai et al thoracic CT was much more sensitive for FB detection than chest x-ray. In our study, similar to previous studies, both chest x-ray and thoracic CT were successful in showing the presence of FB (p=0.038 and p=0.022 respectively) with CT displaying a higher sensitivity. It is important not to use contrast enhancement for the CT imaging of suspected FBA because this can obscure FB with a high opacity^{8,11-13}.

As expected, most of the FB in our study were found in the right bronchial system. The right main bronchus is anatomically more vertical than the left in the midline, explaining the preferential direction of FB to that side (Table 3). Unlike other studies the percentage of organic and inorganic FB was equal^{3,11,13}.

Among 18 patients in whom no FB was detected 17 had a history of aspiration and subsequent symptoms of persistent cough and dyspnea. Only 6 of these patients had radiological findings suggesting FBA. Despite a history of aspiration, it is always possible that FB could lodge in the hypopharyngeal area and cause symptoms such as cough and dyspnea by irritation. Also an aspirated FB may spontaneously expectorated without being noticed^{14,15}.

We found that the rates of FB detection and removal by using either FOB or RB were higher when a clear history of FBA is supported by radiological findings. FOB is easier to learn and use, is widely available and does not require general anesthesia so it could be considered as

an initial procedure if the possibility of FBA needs to be ruled out an/or general anesthesia is undesirable. A disadvantage of FOB is that the patient is conscious, can move and cough causing distal migration of the FB. RB being the gold standard in FBA treatment has advantages when compared with FOB. RB provides superior visibility, the ability to use larger biopsy forceps facilitating easier grasp of FB. RB is performed under general anesthesia, diminishing patient movement and cough reflex^{3,11,15}.

The choice of initial treatment eventually depends on the physicians' familiarity and experience with either bronchoscopic method, the available equipment at hand, and the patients' general condition^{3,8,16} (Figure 3).

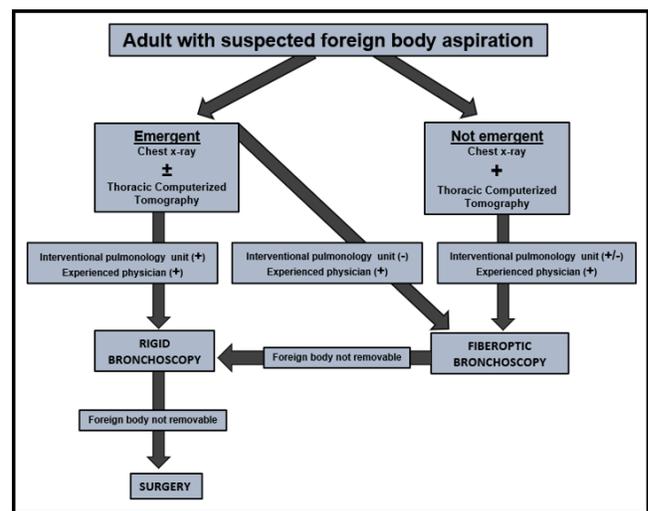


Figure 3: Recommended algorithm for adult patients with suspected foreign body aspiration developed by our interventional pulmonology clinic

Limitations

A limitation of the study is its retrospective nature. Still, only a retrospective structure could objectively demonstrate the physicians' preference with diagnostic and treatment methods in cases of suspected FBA.

CONCLUSION

FOB can be considered for the initial evaluation of cases that do not require emergency RB. It is important to emphasize the high success of RB

in the removal of FB. RB should be considered in critical patients or when FOB fails.

Ethical Committee Approval: In accordance with the Helsinki Declaration and the general practice of our hospital, written and oral approval consent was obtained from the patients. Our study was approved by the University of Health Sciences Turkey, Yedikule Thoracic Diseases and Thoracic Surgery Training and Research Hospital Science Board (22.01.2020 / 237-2) and University of Health Sciences Turkey, Hamidiye Medical Faculty Ethics Committee (24.01.2020/ 20/127/ 46418926-050.03.04).

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