

## DELAYED OR MISSED FOREIGN BODY ASPIRATIONS IN CHILDREN

Alper AVCI

Department of ThoracicSurgery, Faculty of Medicine, CukurovaUniversity, Adana, Turkey.

Serdar ONAT

Department of ThoracicSurgery, Faculty of Medicine, Dicle University, Diyarbakır, Turkey

Refik ULKU

Department of ThoracicSurgery, Faculty of Medicine, Dicle University, Diyarbakır, Turkey

Tahir Sevval EREN

Department of ThoracicSurgery, Faculty of Medicine, Medeniyet University, Istanbul, Turkey.

Cemal OZCELIK

Department of ThoracicSurgery, Faculty of Medicine, CukurovaUniversity, Adana, Turkey.

Corresponding Author: Alper Avci, MD.

Department of ThoracicSurgery, Faculty of Medicine, CukurovaUniversity, Adana, Turkey.

e-mail address: dralperavci@mynet.com

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### ABSTRACT

**Background:** Foreign body aspiration (FBA) is a life-threatening and common problem in children that requires early diagnosis and treatment to reduce serious complications, morbidity and fatal consequences. Missed or delayed diagnosis of FBA which increases the length of symptomatic period, and the rate of complications.

**Methods:** We retrospectively reviewed the records of 148 missed or delayed diagnosed FBA children patients. Age and gender of the patients, duration of symptoms, initial medical diagnosis and treatments before referral, reasons for suspected FBA diagnosis, location and type of foreign bodies and hospital stay time were recorded.

**Results:** During the study period 884 children underwent rigid bronchoscopy for suspected FBA. 247 of them were referred for suspected missed or delayed (7 or more days) FBA and 148 cases of missed or delayed FBA were identified. Male to female ratio was 1.3:1. The most common previous diagnosis was non chronic pulmonary parenchymal infectious. The most common presenting symptoms were cough. Of the 148 FBs, 58% were located in the right bronchial tree. In the 79% of the patients, FBs were organic. Most common seen FBs were sunflower seeds and it's shells.

**Conclusion:** In pediatric age patients with symptoms of chronic recurrent respiratory tract symptoms, even in the absence of medical history, clinical examination and positive radiology, the FBA diagnosis should be excluded. With a minimum suspicion, conformation of diagnosis should be made

by chest CT and flexible bronchoscopy. Extraction should be performed by rigid bronchoscopy which seems to be more reliable

**Keywords:** Foreign Body, Aspiration, Rigid Bronchoscopy, Delayed-Missed Diagnosed

## ÖZET

**Giriş:** Yabancı cisim aspirasyonu (YCA) çocukluk çağında hayatı tehdit eden ve sık görülen bir problemdir. Mortalite, morbidite ve ciddi komplikasyonların önlenmesi için erken tanı ve tedavi gereklidir. Atlanmış veya gecikmiş YCA tanısı, semptomatik süreyi uzatacak ve komplikasyon oranlarını artıracaktır.

**Metod:** Retrospektif olarak atlanmış veya gecikmiş olarak tanısı konmuş olan 148 yabancı cisim aspirasyonlu çocuk hasta çalışmaya dahil edildi. Yaş, cinsiyet, semptom süresi, ilk semptomlar, aspirasyon için danışılmadan önceki tanılar ve uygulanmış olan tedaviler, YCA'dan şüphelendiren nedenler, yabancı cisimlerin trakeobronşial ağaçtaki yerleşimyerleri, yabancı cisimlerin tipleri ve hastaların hastane yatış süreleri kayıt altına alındı.

**Sonuçlar:** Çalışma süresince 884 çocuk hastaya YCA ön tanısı ile rijid bronkoskopi uygulandı. Bu hastaların 247 tanesi atlanmış veya gecikmiş (7 gün ve fazlası) YCA ön tanılı idi. Bu hastaların 148 tanesinde YCA tespit edildi ve yabancı cisim çıkarıldı. Erkek/Kız oranı 1.3/1 idi. En sık konulan ilk tanı kronik olmayan parankimal akciğer enfeksiyonu idi. Çocukların en sık semptomları öksürük idi. Bu 148 YCA 'ın en sık yerleşimyeri %58 ile sağ bronşial ağaç idi. Bu hastaların %79'da yabancı cisim organik kökenli idi. En sık görülen yabancı cisim ay çekirdeği içi ve/veya kabuğu idi.

**Son Söz:** Çocukluk çağında, tekrar eden kronik solunum yolları semptomları olan hastalarda anamnezin negatif olması, fizik muayenenin ve radyolojinin pozitif olmaması durumun da dahi YCA irdelenmelidir. En ufak şüphede dahi toraks BT veya fiberoptik bronkoskopi ile tanı konulmaya çalışılmalıdır. Yabancı cismin çıkarılmasında halen rijid bronkoskopi daha üstün görülmektedir.

**Anahtar Kelimeler:** Yabancı cisim, Aspirasyon, Rijid Bronkoskopi, Gecikmiş Tanılı

## INTRODUCTION

Foreign body aspiration (FBA) remains a common and serious cause of respiratory disorders ranging from life threatening obstruction to milder clinical course. In most cases, FBA causes acute symptoms requiring immediate medical or surgical intervention. In about one third of cases, however, symptoms of FBA are less prominent (1). Insufficient medical history, clinical findings and radiology may result missed or delayed diagnosis of FBA which increases the length of symptomatic period, and the rate of complications (2). The goal should be making FBA diagnosis, as soon as possible, in missed or delayed cases to save children from the complications and additional costs.

## PATIENTS AND METHODS

We retrospectively reviewed the records of all pediatric patients who were referred to our clinic, for suspected FBA for 7 or more days delaying, between 2004 and 2015. Patients with FBA identified and their medical records were evaluated. Age and gender of the patients, duration of symptoms, initial medical diagnosis and treatments before referral, reasons for suspected FBA diagnosis, location and type of foreign bodies and hospital stay time were recorded. All patients were underwent rigid bronchoscope (Karl Storz™, Germany) under general anaesthesia to remove FBs.

In study time interval, there were 884 rigid bronchoscopy were applied for FBA. 247 of these were done for suspected missed or delayed FBs. We analyzed only cases confirmed with removal of the FB (n: 148, 59.92%). Negative bronchoscopic procedures for suspected FBA were excluded (n: 99, 40.08%).

## RESULTS

During the study period 884 children underwent rigid bronchoscopy for suspected FBA. 247 of them were referred for suspected missed or delayed (7 or more days) FBA and 148 cases of missed or delayed FBA were identified. Case records of 148 children aged between 3 months to 15 years whom FBs were removed for missed or delayed FBA between January 2004 and January 2015 were evaluated. Age distribution is summarized in Table I. The male (n: 84) to female (n: 64) ratio was 1.3:1. The duration of symptomatic period before referral to our clinic varied widely ranging from 7 days to 41 months, shown in Table II. The most common previous diagnosis was non chronic pulmonary parenchymal infectious diseases (such as bronchitis, pneumonia) (n: 101), followed by asthma (n: 18), FBA (n: 15), tracheitis-croup (n: 9) and bronchiectasis (5). Sixty-two percent (n: 92) of the patients were referred from different pediatric clinics and 66% (n: 61) of them had a previous hospitalization due respiratory problem one or more times. Most of patients received different treatments according to their misdiagnosis before referral. Antibiotics were the most common treatment and were given 75.6% (n: 112) of the patients. Bronchodilator treatment were given to 29% (n: 43) of the patients, respectively. The most common presenting symptoms were cough (88%), dyspnea (46%), common cold symptoms (30%), unilateral wheezing (24%), sputum production (16%), and fever (8%). Twenty-nine (n: 43) patients had no radiological examination up to the referral time; nine of them were metallic FBs and diagnosis were done by simple x-ray graphy. Rigid bronchoscopy was performed; immediately to 3 patients (cyanosis (n: 2), respiratory arrest (n: 1)), in the first day of referral to 127 patients and in a week to 18 patients. Rebronchoscopy was performed to 4 patients because of unsuccessful first attempts and unsolved bronchospasm during the procedure. Flexible bronchoscopy had diagnosed 14 delayed FBs, one of them was missed diagnosis, and it was mucoid secretion. Nine patient parents refused rigid bronchoscopy, but they came back because of the continuity of symptoms. There were 5 bronchiectasis in the group. Of the 148 FBs; 86 (58%) were located in the right bronchial tree, 53 (35.8%) were located in the left bronchial tree, 6 (4%) were located in the trachea and 3 (2%) were located bilaterally (Table III). In the 79% of the patients (n: 117), FBs were organic and 21% (n: 31) FBs were inorganic. Most common seen FBs were sunflower seeds and its shells. Distribution of FBs is shown in Table IV. There were 11 sudden oxygen saturation decreases, 6 bronchospasm during rigid bronchoscopy and one patient was followed up with mechanic ventilator for 12 hours after bronchoscopy. In two patients, right sided thoracotomies were applied after bronchoscopy as continuing; one for right lower lobectomy because of bronchiectasis, other for metallic FB removal from the middle lobe bronchus. Eighty-nine percent (n: 132) of the patients had a complete remission after bronchoscopy and additional medical treatment for 7-10 days, 8.7% (n: 13) had partial remission and 2% (n: 3) had no symptomatic improvement. We followed up patients 10 days after discharging home. Long term follow up is done by pediatric physicians. Therefore our clinical database is not being adequate for long term follow up analysis.

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## DISCUSSION

FBA is a life-threatening and common problem in children that requires early diagnosis and treatment to reduce serious complications, morbidity and fatal consequences. Most of all aspirations occurring in children and it are associated with significant morbidity and mortality. In USA, 500-3000 children every year die of FBA (3). Diagnosis of FBA may be difficult due to lack of history or signs of aspiration with normal radiology. The decision to perform a bronchoscopic study in patients was based on four characteristics: positive clinical history, symptoms, physical examination and radiological findings. Since delaying diagnosis results in potentially severe complications, bronchoscopy is indicated with an appropriate history and when a FB is suspected. To prevent delayed diagnosis, characteristic symptoms, clinical and radiological signs of FBA should be checked in all suspected cases. Despite all, missed or delayed FBA has remained a consistent problem in children.

Delayed diagnosis of FBA is an important problem especially in developing countries, such as Turkey; 17-69% of the patients diagnosed more than 7 days after FBA in different studies (4). Cough, breathlessness and choking are common symptoms of FBA. Hoeve et al. (5) found signs and symptoms to be very sensitive features but their specificity was low. As the FB passes into the trachea

further to bronchi, these symptoms resolve and relatively asymptomatic period may begin. During this time, FBA diagnosis may be more difficult to ascertain (4). Radiopaque FBs are obvious on radiographic studies, only 10% of FBs are radiopaque. The findings of chest radiography are normal in up to 30% of children who aspirated FB. The sensitivity and specificity of chest radiography for FB detection are only 68% and 67% (6-7).

In our series, the reasons of delaying FBA diagnosis were noted as; no history of typical aspiration, escaping both parent's and physicians notice, because of the lack of exact history, misdiagnosis as lower respiratory tract infection, relatively asymptomatic period of FBA, antibiotic and steroid treatment which mask the symptoms, normal chest x-ray graphs, misdiagnosed without any radiological examination (especially for radiopaque FBs) at the admitting time, refusing bronchoscopy by parents, fear of children to be punished, difficulties to reach our clinic from countryside. It is not always diagnosis delay, sometimes it is treatment delay. Without concerning the reason, delayed diagnosis of FBA is an important problem.

Getting suspicious about FBA is the first step for delayed FBA diagnosis. Persistence of lower respiratory tract infection or asthma in spite of adequate treatment needs re-evaluation for FBA. Similarly recurrent episodes of wheeze and dyspnea, and radiological evidence of FB provides FBA delayed FBA suspicion. A carefully designed standardized evaluation should be employed to decrease unnecessary bronchoscopies (8). For the children in whom FB is somewhere in the differential diagnosis, flexible bronchoscopy seems to be best diagnostic procedure (2). Chest Computed Tomography (CT) can be helpful in selected patients with atypical histories and radiographic findings of suspected FBA. CT is the most sensitive diagnostic imaging technique for FBA (9). In our study, 247 patients were referred our clinic for suspected delayed FBA, and 148 of them had FBA. For the first seven years of study; persistence or recurrence of symptoms, radiologic findings, re-evaluation of medical history and confession of child were the factors for referral rigid bronchoscopy for suspected FBA. Additionally, for last three years, our pediatric chest disease clinic has been using chest CT and flexible bronchoscopy for certain diagnosis for FBA. The incidence of negative bronchoscopies range for suspected delayed FBA range from 9-16.5 percent in literature (10). In our study this ratio is 40.1%. By using CT and flexible bronchoscopy, our negative bronchoscopy rate had been decreased into normal limits for last three years.

Some clinics use flexible bronchoscopy with removal of substantially all FBs (11), while most authors consider rigid bronchoscopy the best procedure. In our practice, rigid bronchoscopy was performed under general anaesthesia. The patients underwent rigid bronchoscopy as soon as possible.

Most of the aspirated FBs were organic in our study. Seed and seed shell aspiration were the most common aspirated FBs. Nuts are the most commonly aspirated FB in Western World, however seed aspiration is more commonly reported in Middle East countries. Variation in types of FBs can be explained by differences in culture, region and nutritional habits (2-12). The aspirated foreign bodies were often bronchial, mostly removed from right main bronchus or intermedier bronchus. However, FBs can be tracheal, multiple or bilateral. In fact, the location is not very important in delayed FBA, since all the bronchial tree is explored carefully and systematically. In our study, three patients who had been followed up underwent emergency bronchoscopy because of the sudden respiration failure. It shows us the possibility of translocation of FBs in the tracheobronchial tree

Delay in diagnosis of FBA increases the rate of complications. Delaying allows the patients to develop an intense inflammatory reaction around the FBs. This reaction is more common and serious with FBs of plant origin and also increase the complications associated with the removal procedure (4). Delayed diagnosis also increases the side effects of unnecessary medical treatment and hospital stay costs. Furthermore, in various series the presence of a foreign body has been associated with airway hyper reactivity or development of bronchiectasis, which may progress in number and severity and can lead the patient to require a lobectomy as a last therapeutic resort (13). We prefer to follow up FBA patients with bronchiectasis after removing of FBs. But sometimes foreign body is been determined in lobectomy specimen bronchus after lobectomy. It should be kept in mind that the

curative treatment of unilateral localized bronchiectasis is anatomic lobectomy, even if caused by FBA.

## CONCLUSIONS

FBA continue to be a cause of morbidity and mortality in children. Prevention is best, but early diagnosis is important factor in the treatment. A witnessed choking event is the most important historical information in diagnosis. Parent education about the symptoms is important because of this. Also parents should be informed that babies should never eat seeds, nuts up to preschool age. Small spherically shaped toy parts should be avoided from babies who try to put everything into their mouth.

In pediatric age patients with symptoms of chronic recurrent respiratory tract symptoms, even in the absence of medical history, clinical examination and positive radiology, the FBA diagnosis should be excluded. With a minimum suspicion, confirmation of diagnosis should be made by chest CT and flexible bronchoscopy. Extraction should be performed by rigid bronchoscopy which seems to be more reliable.

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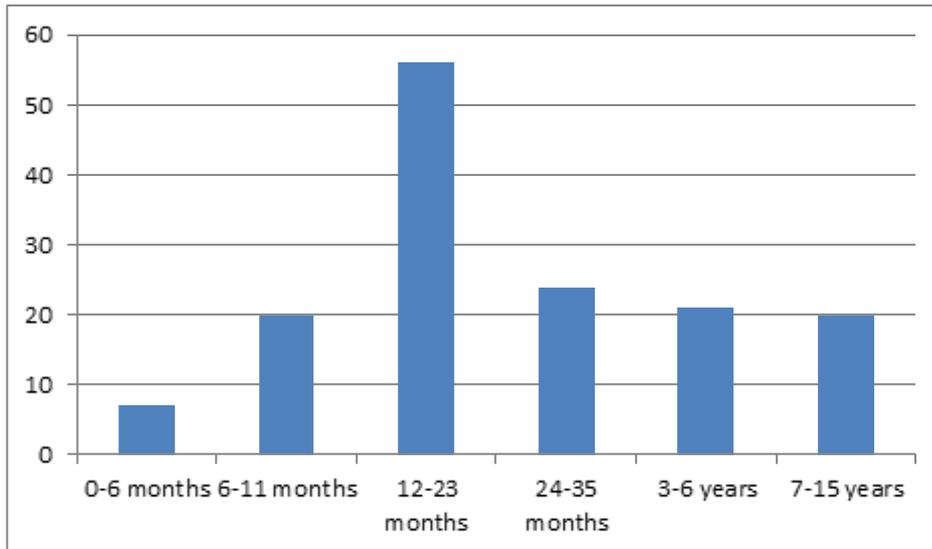


Table 1: Age distribution of the patients

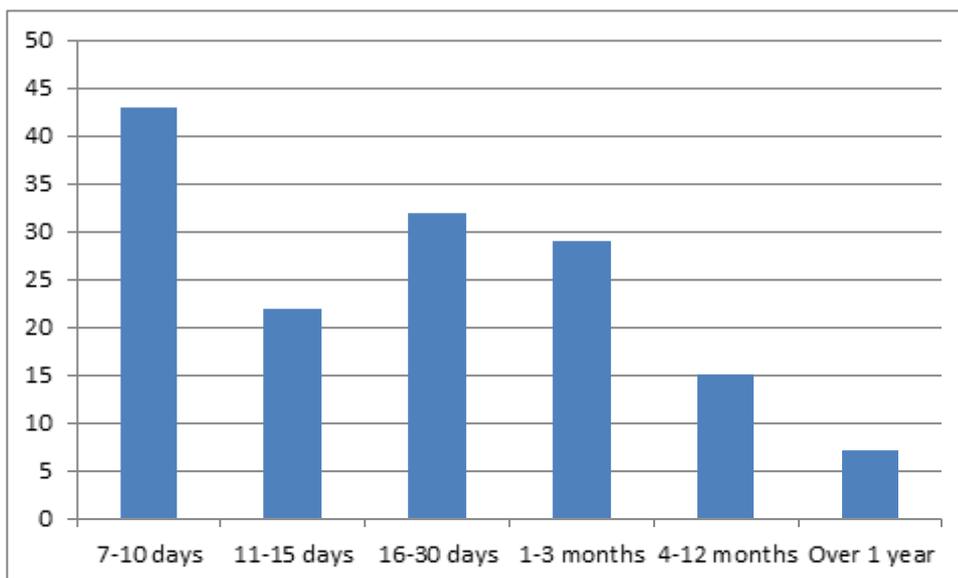


Table 2: Duration of symptomatic period before referral.

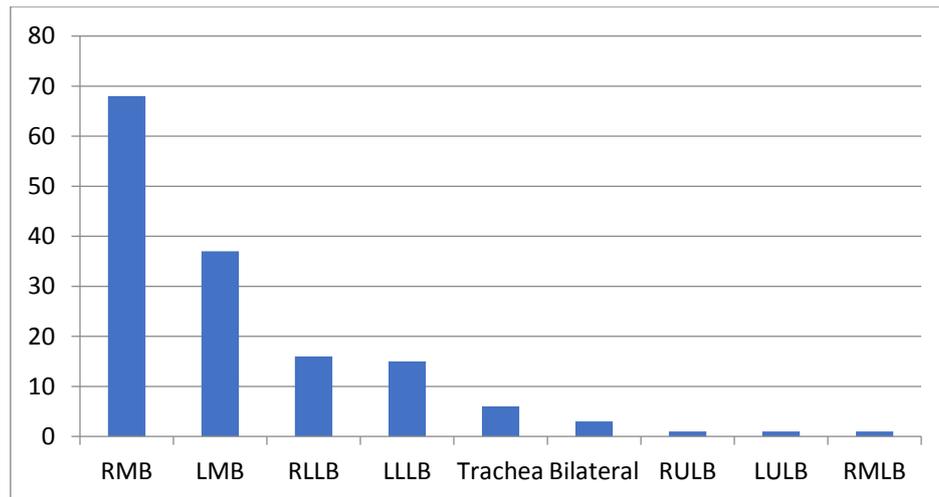


Table 3: FBs locations in the tracheobronchial tree.

RMB: Right main bronchus (including intermediate bronchus)

LMB: Left main bronchus

RLLB: Right lower lobe bronchus

LLLB: Left lower lobe bronchus

RULB: Right upper lobe bronchus

LULB: Left upper lobe bronchus

RMLB: Right middle lobe bronchus

Sunflower seed, shell of it	42
Hazelnut, peanut, walnut, shell of them	40
Watermelon seed, pumpkin seed, shell of them	20
Plastic materials	10
Pen cup	9
Metallic materials	9
Corn	5
Others	13

Table 4: Distribution of FB types.