RESEARCH ARTICLE

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Received: 10.08.2020
Acceptance: 05.08.2021
DOI: 10.18521/ktd.778715

Konuralp Medical Journal
e-ISSN1309–3878
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www.konuralptipdergi.duzce.edu.tr

Foreign Body Aspiration in Children; Duzce University Five-Years Results

ABSTRACT

Objective: Foreign body aspiration is a preventable cause of mortality and morbidity especially in younger than three years old children. The aim of this study is to determine the risk factors, causes and prognosis in patients with foreign body aspiration.

Methods: In this study, laboratory and examination findings of 35 patients who underwent bronchoscopy, because of suspected foreign body aspiration, were retrospectively analyzed.

Results: Of the 35 patients included in the study, 19 were boys and 16 were girls. The mean age was 3,2. The most causes of application were cough, and wheezing. Foreign body was detected in the right main bronchus in 62,8%, in the left main bronchus in 25,7%, in the trachea in 5,7% and in both bronchi in 5,7% of the patients.

Conclusions: Early diagnosis and intervention significantly reduce the mortality and morbidity in foreign body aspirations. Prevention of foreign body aspirations is possible with the education of babysitters and family members.

Keywords: Foreign Body Aspiration, Childhood, Bronchoscopy.

Çocuklarda Yabancı Cisim Aspirasyonları; Düzce Üniversitesi, 5 Yıllık Sonuçlar

ÖZET

Amaç: Yabancı cisim aspirasyonu, özellikle 3 yaşından küçük çocuklarda önlenebilir bir mortalite ve morbidite nedenidir. Bu çalışmanın amacı yabancı cisim aspirasyonu nedeniyle başvuran hastalarda risk faktörleri, nedenleri ve prognozu belirlemektir.

Gereç ve Yöntem: Yabancı cisim aspirasyonu şüphesiyle bronkoskopi yapılan 35 hastanın şikayetleri, laboratuvar ve muayene bulguları retrospektif olarak incelendi.

Bulgular: Çalışmaya alınan toplam 35 hastanın 19'u erkek ve 16'sı kızdı. Hastalar ortalama 3,2 yaşındaydı. Hastaların hastaneye başvuru nedeni en sık öksürük ve hırıltılı solunum idi. Yabancı cisim hastaların %62,8'inde sağ ana bronşta, %25,7'sinde sol ana bronşta, %5,7'sinde trakeada ve %5,7'sinde de her iki bronşta saptandı.

Sonuç: Yabancı cisim aspirasyonlarında hızlı tanı ve erken müdahale ile mortalite ve morbidite oranları belirgin şekilde azalmaktadır. Yabancı cisim aspirasyonlarının önlenmesi ancak bebek bakıcılarının ve aile bireylerinin eğitimi ile mümkündür.

Anahtar Kelimeler: Yabancı Cisim Aspirasyonu, Çocukluk Çağı, Bronkoskopi.

INTRODUCTION

Foreign body aspiration is defined as the aspiration of a foreign body into the tracheobronchial tree (1). As the result of inhalation of materials such as foods, toys, bones, seeds occur acute-onset upper respiratory airway obstruction. The main reasons are tendency to talk, cry and move while eating or put objects in the mouth unconsciously. On the other hand, the absence of molar teeth is another risk factor for aspiration. Even though aspiration occurs with non-food products, such as small plastic toys, metal objects etc., most of the cases occur with food (2). Foreign body aspiration is a preventable cause of mortality and morbidity especially in younger than three years old children (3).

Cough, cyanosis and wheezing are the most symptoms and findings (4). In many cases, cardiovascular arrest and sudden death are observed (5). Rarely any symptoms are seen (6). Complications may occur such as emphysema, bronchial collapse and pneumonia as the result of aspiration (7). X-ray is not always supported foreign body aspiration findings (8). Bronchoscopy is the best-known technique for diagnosis and treatment (9).

In this study, foreign body aspiration causes, risk factors and morbidity rates were evaluated retrospectively in the five years period in patients who admitted to our emergency department.

MATERIAL AND METHODS

Between August 2014 and November 2019, patients who applied to Duzce University Faculty of Medicine Hospital Paediatric Emergency Department because of foreign body aspiration were retrospectively analysed. The diagnosis was confirmed with bronchoscopy. Bronchoscopy was performed in the operating room under general anaesthesia. The gender, age, symptoms, physical examination and radiological findings, location and the type of the foreign body, time until bronchoscopy and the discharge time after bronchoscopy, the complications after the procedure and the seasonal relationship of the foreign body aspiration were evaluated.

Statistical Analysis: Data obtained in this study evaluated with descriptive statistics such as mean, standard deviation, numbers and percentages. Also Fisher's exact test was used to analyse categorical variables between groups. IBM SPSS version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) statistical package program. P values of 0.05 was considered statistically significant..

RESULTS

Of the 35 patients included in the study, 19 (54%) were boys and 16 (46%) were girls. The mean age was 2,41± 2,12 (10 months-7 years) of the boys and was 4,16± 4,69 (8 months-16 years) of the girls. 25 cases (71%) were under three years old. 10 (28%) patients applied in the spring (March, April, May) and similarly, 10 patients (28%) applied in the autumn (September, October, November). On the other hand, the most common application time was in May (n=5) and the least application was in February (n = 1). The most causes of application were cough, and wheezing. 51% (n = 18) of aspirations took place under the babysitter supervision. 97% (n = 34) of the patients applied to a hospital on the same day and 74% of the patients were referred from another hospital. None of the patients had low oxygen saturation. In the physical examination, wheezing and rales were detected in 24 patients (68%). Diminished breath sound was found in 17 patients (48%). 5% of patients (n = 2) had no pathological breath sound. Posteroanterior chest radiography was performed in all cases. Computed tomography (CT) was performed in 2 patients (5%) due to clinical and radiological suspicion and the diagnosis was confirmed. The most common localization of the foreign body in the right main bronchus (62%). The other localizations were in the left main bronchus, trachea and both bronchi. Bronchoscopy was performed in 82% of the patients (n = 29) in the day of admission. 82% (n = 29) of the foreign bodies were food. On the other hand, needle aspiration was significantly high in patients over three years old ($p<0.05$). In a case with a recurrent pneumonia, CT was performed. In this case, part of the toy was removed by bronchoscopy after the diagnosis with CT. No complication was detected in 92% of the patients (n = 32) after bronchoscopy. However, pneumonia developed in 8% of patients (n = 3). Mean hospitalization period after

bronchoscopy was 1,2 days. 88% (n = 31) of the patients were discharged one day after bronchoscopy, the longest hospitalization time was 7 days. No patient was needed intensive care unit and none of the patient died. Demographic characteristics and findings were shown at Table 1, 2.

Table 1. Symptoms and findings of the patients according to age three

		<3 years (n=25)	>3 years (n=10)	p
Symptom; n (%)				
	Swallowing needles	1 (4.0)	1 (10.0)	NS
	Frequent lower respiratory tract infections	0	1 (10.0)	NS
	Coughing	19 (76.9)	8 (80.0)	NS
	Wheezing	5 (20.0)	0	NS
Foreign body type; n (%)				
	Needle	0	**3 (30.0)***	**0.03**
	Food	22 (88.0)	7 (70.0)	NS
	Toy	3 (12.0)	0	NS
Breath sound; n (%)				
	Normal	0	2 (20.0)	NS
	Bilateral rales, wheezing	7 (28.0)	4 (40.0)	NS
	Diminished breath sounds in the right side	10 (40.0)	1 (10.0)	NS
	Coarse breathe sound in the right side	3 (12.0)	0	NS
	Diminished breath sounds in the left side	4 (16.0)	2 (20.0)	NS
	Retraction, wheezing	0	1 (10.0)	NS
	Coarse breathe sound in the left side	1 (4.0)	0	NS
Radiographic findings; n (%)				
	Normal	11 (44.0)	8 (80.0)	NS
	Atelectasis in the right lower lobe	1 (4.0)	1 (10.0)	NS
	Hyperaeration in the right lung	7 (28.0)	0	NS
	Hyperaeration in the left lung	3 (12.0)	0	NS
	Total atelectasis on the left lung	1 (4.0)	0	NS
	Fissuritis on the right	0	1 (10.0)	NS
	Atelectasis in the left lower lobe	1 (4.0)	0	NS
	Total atelectasis on the right lung	1 (4.0)	0	NS
Localization; n (%)				
	Right main bronchi	17 (68.0)	5 (50.0)	NS
	Left main bronchi	6 (24.0)	3 (30.0)	NS
	Trachea	1 (4.0)	1 (10.0)	NS
	Bilateral	1 (4.0)	1 (10.0)	NS

NS: non-significant

DISCUSSION

Foreign body aspiration is a major cause of mortality and morbidity, especially in under 3 years old children. Acute respiratory distress, chronic and irreversible lung injury and death are important complications (3). In the literature, death caused by foreign body aspiration is between 0 and 1.5% in all age groups (10). The main causes of death are asphyxia, pneumonia and sepsis, delay in diagnosis, sudden death, cardio-pulmonary arrest, anaesthesia and bronchoscopy complications (11). In our study, no mortality was detected due to foreign body aspiration. Early application, experienced medical team and early intervention could be the main reasons of no mortality.

Foreign body aspiration is frequently encountered under three years old children. They desire to bring foreign bodies to their mouths, when playing, running or crying, and their swallowing functions, mouth, chin, larynx and epiglottis anatomy are not sufficiently developed (3). On the other hand because of they are more active than girls, aspiration is more commonly seen in boys (10). Similarly literature, in our series, most of our patients were under 3 years old and were boy, but there was no statistically significant difference between the sexes (p>0.05).

Table 2. Symptoms and findings of the patients according to gender and age

	Girls (n=16)			Boys (n=19)		
Age; mean± SD (years)	2,41± 2,12 (10 months-7 years)			4,16± 4,69 (8 months-16 years)		
	<3 years (n=11)	>3 years (n=5)	p	<3 years (n=14)	>3 years (n=5)	p
Symptom; n (%)						
Swallowing needle	0	1 (20.0)		0	0	
Frequent lower respiratory tract infections	0	1 (20.0)		0	0	
Coughing	10 (90.9)	3 (60.0)	NS	10 (71.4)	5 (100)	NS
Wheezing	1 (9.1)	0		4 (28.6)	0	
Foreign body; n (%)						
Needle	0	2 (40.0)		0	1 (20.0)	
Food	10 (90.9)	3 (60.0)	NS	12 (85.7)	4 (80.0)	NS
Toy	1 (9.1)	0		2 (14.3)	0	
Breath sound; n (%)						
Normal	0	1 (20.0)		0	1 (20.0)	
Bilateral rales, wheezing	2 (18.2)	3 (60.0)		5 (35.7)	1 (20.0)	
Diminished breath sounds in the right side	5 (45.5)	0		5 (35.7)	1 (20.0)	
Coarse breath sound in the right side	2 (18.2)	0	NS	1 (7.1)	0	NS
Diminished breath sounds in the left side	2 (18.2)	0		2 (14.3)	2 (40.0)	
Retraction, wheezing	0	1 (20.0)		0	0	
Coarse breath sound in the left side	0	0		1 (7.1)	0	
Radyographic findings; n (%)						
Normal	3 (27.3)	3 (60.0)		8 (57.1)	5 (100)	
Atelectasis in the right lower lobe	0	1 (20.0)		1 (7.1)	0	
Hyperaeration in the right lung	4 (36.4)	0		3 (21.4)	0	
Hyperaeration in the left lung	2 (18.2)	0		1 (7.1)	0	
Total atelectasis on the left lung	1 (9.1)	0	NS	0	0	NS
Fissuritis on the right	0	1 (20.0)		0	0	
Atelectasis in the left lower lobe	0	0		1 (7.1)	0	
Total atelectasis on the right lung	1 (9.1)	0		0	0	
Localization; n (%)						
Right main bronchi	7 (63.6)	4 (80.0)		9 (64.3)	1 (20.0)	
Left main bronchi	3 (27.3)	0	NS	3 (21.4)	3 (60.0)	NS
Trachea	1 (9.1)	1 (20.0)		0	0	
Bilateral	0	0		2 (14.3)	1 (20.0)	

NS: non-significant

Seasonal foreign body aspiration cases have been reported in the literature. In a study, Albirmawy et al were found that the highest frequency of foreign body aspirations in Spring and Summer months. They stated that a high percentage of watermelon and peanut are consumed in summer (12). Tan et al. concluded that some geographic and seasonal variations, were the important factors of foreign body aspirations. They found that peanut and the other nuts were the most common foreign bodies. As these foods are consumed more in the summer, it could be thought that the possibility of aspiration of these foods increases (13). Most of the food that was aspirated were nuts and seeds in our study. Thus, we found that the aspirations took place during the spring and summer seasons generally, similar to the previous literature.

The first step in the diagnosis of foreign body aspiration is carefully taking the history and making the physical examination. The most common symptoms and findings are; cough, wheezing and rapidly developing respiratory distress (4). Symptoms and signs may vary depending on the duration, location, size of the foreign body and characteristics of aspiration material in course of time. Sometimes patients may be completely asymptomatic. In this case, aspiration is diagnosed with the patient's history. In our study, there was no asymptomatic patient. The most common symptoms were sudden cyanosis, cough and wheezing. On the physical examination, wheezing, stridor or rales were the most common findings on the aspirated side of the lung.

The first diagnostic approach is chest radiography in patients with suspected foreign body aspiration. If there is a radiopaque foreign body, the diagnosis can be made easily. However, most of the foreign bodies are food, 90% of them are non-opaque and they are generally not seen on radiography (8). In case of the absence of radiographic findings, foreign body aspiration does not exclude. If the history and the patient's

symptoms are compatible for foreign body aspiration, bronchoscopy must be performed (14). Although bronchoscopy is a simple and reliable procedure, it may lead to complications such as pneumonia, pneumothorax, pneumo-mediastinum, airway oedema, respiratory stress and cardiac arrest (15). For this reason, bronchoscopy should be done by experienced hands. While most of our patients did not have any complications after bronchoscopy, only 3 patients developed pneumonia. Pneumonia may occur due to interventional procedures or may be associated with delay in diagnosis. A broad spectrum antibiotic is recommended for the treatment of the pneumonia secondary to foreign body aspiration (16).

The most common radiographic finding of cases with foreign body is the hyperaeration in the aspirated side (14). The right main bronchus is shorter, thicker and more vertical than the left main bronchus in children. Therefore, more air enters into the right system in inspiration. For this reason, foreign bodies especially must seek in the right main bronchus (10). Similar to the literature, most of the foreign bodies were in the right main bronchus in our patients and the hyperaeration was in the right lung in X-ray.

CONCLUSION

Foreign body aspiration is a common reason for applying to the emergency room, especially in children younger than 3 years old. Rapidly diagnosis and early intervention significantly reduce the mortality and morbidity. CT helps in the differential diagnosis in patients who have been complaining for a long time. Bronchoscopy is the gold standard in diagnosis and treatment. It should be performed in the operating room and by experienced hands to minimize complications. Prevention of foreign body aspirations is possible with the education of babysitters and family members.

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