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Original Article

Foreign body aspiration through the eyes of a pediatric pulmonologist: Is it possible to reduce the rate of negative rigid bronchoscopies?

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ABSTRACT

Background. Identifying a foreign body aspiration (FBA) still remains a diagnostic difficulty. Moreover, the indications for bronchoscopy in subjects of suspected foreign bodies are not clear. The aim of this study was to evaluate the effectiveness of pediatric pulmonologists in diagnosing FBA.

Methods. This was a retrospective, single-center study on children who underwent rigid bronchoscopy for suspected FBA. Data on the patients were obtained from the medical records. Patients who had foreign bodies (FB) identified during rigid bronchoscopy were classified as FB positive, and those in whom rigid bronchoscopy did not detect FB were defined as FB negative. Demographic data as well as consultation status with a pediatric pulmonologist were compared between these two groups. Furthermore, the patients were categorized into three groups based on their clinical scores that assessed the likelihood of the presence of FB: low risk, moderate risk, and high risk.

Results. Out of 474 rigid bronchoscopies, 232 (48.9%) detected FB. Consultation by a pediatric pulmonologist was not requested in 388 (81.8%). Out of these 388 patients, 206 (53%) were negative for FB. In terms of FB detection success, there was no difference between individuals who sought pulmonology consultation and those who did not (58.1% vs. 53.1% respectively, p=0.059). However, when the children were categorized based on their risk levels, the incidence of detecting FB among children in low-risk group was 42% when they received consultation from the pulmonology department, whereas this incidence dropped to 5.6% when pulmonology consultation was not sought (p<0.001).

Conclusions. Consulting a pediatric pulmonologist, particularly for low-risk individuals, might reduce the likelihood of performing unnecessary bronchoscopies. Given that rigid bronchoscopy is an intrusive technique, it is crucial to reduce the number of negative bronchoscopies in order to mitigate complications associated with it.

Key words: foreign body, pediatric pulmonologist, rigid bronchoscopy.

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Foreign body aspiration (FBA) can cause significant morbidity and mortality in the pediatric population. It is a serious condition that commonly manifests in young children and necessitates prompt intervention in order to prevent potential complications and the risk of long-term sequelae. Most of the cases occur in infants and toddlers, and only a few children show the classic triad of choking, coughing, and unilateral wheezing or decreased air entry.[1]

Currently, rigid bronchoscopy performed under general anesthesia is the accepted method for removing a foreign body (FB) from the airways in pediatric patients. The widespread use of this method for both diagnostic and therapeutic intentions resulted in a significant proportion of negative bronchoscopies, ranging from 10 to 61% as reported by different research groups.[2-4] In addition, complications are not uncommon during rigid bronchoscopy, especially when performed on small children. Unnecessary bronchoscopy not only exposes the child to the potential risks associated with anesthesia, but it can also lead to perioperative complications such as bronchospasm, desaturation, edema, and hemorrhage.[5]

The indications for bronchoscopy in patients with suspected FB are not clearly defined. Each centre usually follows its own procedures based on the patient's medical history, physical examination, and radiological results.[6-8] Various scores and algorithms have been suggested so far to predict the existence of an FB and reduce the rate of negative bronchoscopies.[7-11] Nevertheless, none of them have shown adequate specificity or sensitivity to definitively establish the diagnosis.[9] Because of the serious long-term consequences of missed FBA and the difficulty of a definite diagnosis, many children who undergo rigid bronchoscopy arrive unfortunately with negative results.[8] The aim of this study was to evaluate the effectiveness of pediatric pulmonologists in predicting FBA. To the best of our knowledge, this is the first study from our Türkiye identifying the role of pediatric pulmonologists in the approach of FBA diagnosis. The secondary outcome of interest was to comprehensively analyze the characteristics of rigid bronchoscopies conducted for suspicious cases of FBA at our center and to identify disparities between bronchoscopies with high and low diagnostic success, with the purpose of avoiding unnecessary procedures and mitigating associated risks.

Materials and Methods

Study design and population

In this retrospective, single-center, cross-sectional descriptive study, we reviewed the hospital operating room records of all children aged 0 to 18 years who underwent rigid bronchoscopy for suspected FBA at our tertiary academic center from January 2015 to October 2023. A confirmed FB in the esophagus or larynx was excluded from this group.

In our center, suspected FBA is one of the reasons for the admission to the pediatric emergency department. The standard practice is to refer all patients who are suspected of having FBA to a pediatric surgeon. After the clinical and radiological evaluation of the patient, it is decided whether or not to perform rigid bronchoscopy. Some patients are consulted by a pediatric pulmonologist upon the decision of the pediatric emergency physician or pediatric surgeon. In our center, the criteria for consulting a pediatric pulmonologist for children with suspected FB are not well defined. Pediatric pulmonologists, if they are consulted, make decisions through a comprehensive approach to the patient, including physical examination, imaging, and clinical information.

In this study, children were divided into two groups as positive for FB and negative for FB. Patients who had FB identified during rigid bronchoscopy were classified as FB positive and in those whom rigid bronchoscopy did not detect FB were defined as FB negative. Additionally, the most recent scoring system categorized children as either low, moderate, or high risk of having FB.[12] The following criteria,

which consisted of the patient's medical history, physical examination, and radiological findings, were evaluated: a choking episode (0- no, 2- suspected or observed), exposure to any foreign body (0- no, 1- yes), a sudden cough during or after the event (0- no, 1- yes), absence of fever (≥ 38 °C) along with absence of rhinorrhea (0- no, 1- yes), unilateral wheezing or decreased air entry on auscultation (0- no, 2- yes), the presence of stridor (0- no, 1- yes), and imaging findings suggestive of FBA on chest X-ray (0- no, 2- yes). Regardless of the other components of the score, radiopaque FB received a full 10 points. The cumulative score (from lowest to highest risk) was between 0 and 10. Each child was categorized into one of three risk categories, according to their total score: low risk (1-3 points), moderate risk (4-6 points), or high risk (7-10 points). For each risk group, whether patients were referred to pediatric pulmonology was extracted from the medical records in order to ascertain the role played by a pediatric pulmonologist in determining the necessity for rigid bronchoscopy when FBA was suspected.

Clinical history, vital signs, and physical examination at the time of presentation were accessed from electronic medical records for each patient. Age, gender, witness situation of the event, the time elapsed between suspected aspiration and admission, suspected FB type, the presenting symptoms and signs and location of FB within pulmonary branching, were additional extracted data. These data were compared between positive FB and negative FB groups.

At our institution, plain radiographs are not formally reported by a radiologist unless consulted. Since the radiographic interpretation by the pediatric surgeon was recorded in the system, these notes were retrieved retrospectively. In addition, chest computed tomography (CT) scans reported by radiologists were gathered. Furthermore, rigid bronchoscopy findings were examined paying particular attention to the foreign body's type and location. FBs were classified into two groups as organic and inorganic. The amount of time that elapsed between FBA and admission to the hospital was grouped as less than 24 hours, less than a week, more than a week and more than a month. The records were examined for underlying diseases as well as diseases that emerged during the follow-up period.

Parental written informed consent was obtained in clinical practice prior to conducting rigid bronchoscopy on pediatric patients. As this study was conducted retrospectively, the analysis of the data obtained from medical records did not necessitate obtaining consent. The research protocol for this study was approved by the Clinical Research Ethics Committee of Hacettepe University (Reference number: SBA 23/186).

Statistical analysis

Statistical analyses were performed using SPSS statistical software, version 21 (IBM Corp., Armonk, NY, USA). Normally distributed continuous variables were analyzed using student t-test and expressed as mean ± standard deviation (SD). Non-normally distributed continuous variables were analyzed using Mann-Whitney U test and expressed as median (interquartile range - IQR). Shapiro-Wilk test was used to assess normality where appropriate. Categorical variables were presented as percentages (%) and analyzed using chi-square test or Fisher's exact test. Values of $p<0.05$ were considered statistically significant. To examine the relationships among multiple-choice categorical variables multiple chi-Square test was performed and Bonferroni method for p-value adjustment was applied.

Results

Among a total of 483 rigid bronchoscopy procedures performed with a suspicion of FBA at our pediatric tertiary care center during the study period, 474 were included in the study. Nine children with a confirmed FB in the larynx or esophagus were excluded from the analysis.

The median age of all patients at presentation was 19.44 months (IQR: 13.5-28.8) with the majority of the patients (n=387, 81.6%) younger than 3 years of age. Out of 474 rigid bronchoscopies, 232 (48.9%) detected FB. Four patients underwent two rigid bronchoscopies each to control if any residual material exists.

Among patients diagnosed with FBA via rigid bronchoscopy, 85 (18%) were admitted to the hospital within the initial twenty-four hours of the inciting event. Out of all the patients, 98.6% were admitted to the children's emergency services, while the remaining patients were admitted to either pediatric surgery or pediatric pulmonology outpatient clinics. In a 6-year-old boy previously diagnosed with asthma, FB was detected via rigid bronchoscopy more than 1 year after the doubtful event. Asthma/bronchial hyperreactivity (n=19, 4%) was the most frequent underlying disease in children who underwent rigid bronchoscopy due to suspected FBA.

Foreign bodies were more commonly found in the right lung (n=123, 53%) compared to the left (n= 89, 38.3%). In five (2.1%) patients, FB was detected in both the left and right main bronchus with the remaining in the trachea or carina (n=15, 6.4%). Organic material represented 84.9% of these foreign bodies with sunflower seeds being the most commonly aspirated material followed by hazelnuts, walnuts and peanuts.

Radiopaque foreign bodies such as turban pins, toy parts and pen caps represented the majority of the aspirated inorganic material. Out of 232 patients diagnosed with FBA, a definite history of experiencing abrupt choking while holding an object in the mouth or chewing something was collected from 204 (87.9%) patients. Similarly, out of the 242 patients without FBA, 207 of them (85.5%) reported a definite history of FBA (p=0.449).

Cough that started after the witnessed event and subsequent rhonchi in physical examination were the most common findings with a rate of 36%. Other presenting symptoms included solely wheezing, solely coughing, choking, respiratory distress, chest pain and flushing or cyanosis.

Among vitals, median transcutaneous oxygen saturation level on room air at presentation was 96% (min-max: 70-100%) in children with FBA. On physical examination, breath sounds were normal in 63% and 14.2% of patients without FBA and with FBA, respectively (p<0.001). Decreased breath sounds and rhonchi were noted in 71% of children with FBA. FBA was absent in 82.1% of patients who had a normal physical examination, while it was present in 17.8% of patients with a normal physical examination.

At least one chest radiograph was performed on 472 patients as an essential component of their diagnostic evaluation. Since two of the children had CT scans at the initial center they were admitted, chest X-rays were not performed at our center. A total of 27 patients had low-dose CT scan imaging. CT scans of two patients were normal although rigid bronchoscopy detected FB in both patients.

The radiologic interpretation of chest radiographs by pediatric surgeons for 136 patients (n=28.7%) were not available in the notes. No radiologic abnormality in chest X-rays was detected in 10.8% of patients with FBA and in 27.6% of patients without FBA (p<0.05). Unilateral air trapping (n=125, 54.3%) was the most common finding in the chest radiograph of patients with FBA. Atelectasis and bilateral air trapping were the other radiologic features noted in both groups.

In two children who underwent rigid bronchoscopy, pulmonologists also performed flexible fiberoptic bronchoscopy (FFB). FFB was conducted because of recurrent pneumonia in one of these patients. FB was detected although physical examination and chest radiography yielded normal results, and it was removed by rigid bronchoscopy. The second patient with the diagnosis of asthma underwent rigid

bronchoscopy due to the history of suspected FB, but a FB was not detected.

Among diagnostic tests such as history of the suspected FBA, physical examination, and radiographic signs, physical examination had the highest level of specificity and accuracy (63%, 95% confidence interval [CI]: 56.39-68.92%; and 73.6%, 95% CI: 69.86-77.94%, respectively). The most sensitive diagnostic tool was the history of the suspected FBA (87.9%; 95% CI: 83.03-91.83%). Positive predictive value and negative predictive value of physical examination were the highest to suspect FB (69%, 95% CI: 65.06-72.42%; and 82%, 95% CI: 76.80-86.51%, respectively). However, the sensitivity of the evaluation of physical examination and radiographic signs together was higher (94.5%, 95% CI: 93.88-98.78%) than the assessment of history, physical examination or radiography alone. Demographic data of study subjects are shown in Table I.

Table I. Demographic data of study subjects

	Total	Positive FBA	Negative FBA	p-value
Number of patients, n (%)	474 (100.0)	232 (48.9)	242 (51.1)	
Age (months), median (IQR)	19.44	20 (5.1-195.2)	18.6 (3.2-201)	0.059
Male: Female ratio	1.25:1 (264:210)	1.6:1 (143:89)	1:1 (121:121)	**0.013**
Time to presentation, n (%)				
Unknown	57 (11.8)	22 (9.5)	35 (14.4)	0.07
<24 hours	165 (34.8)	85 (36.6)	80 (33.0)	0.42
≥24 hours, <1 week	180 (38.0)	86 (37.1)	94 (38.8)	0.68
≥1 week, <1 month	58 (12.2)	28 (12.1)	30 (12.3)	0.92
≥1 month	13 (2.7)	10 (4.3)	3 (1.2)	0.02
≥1 year	1 (0.2)	1 (0.4)	0 (0)	0.31
Underlying disease, n (%)				
None	416 (87.8)	209 (90.1)	207 (85.5)	0.13
Asthma/bronchial hyperreactivity	19 (4.0)	5 (2.2)	14 (5.8)	0.045
Down syndrome	4 (0.8)	1 (0.4)	3 (1.2)	0.31
Prematurity	5 (1.1)	3 (1.3)	2 (0.8)	0.61
Others	30 (6.3)	14 (6.0)	16 (6.6)	0.76
Physical examination findings, n (%)				
Total	474	232	242	
Normal	186 (39.2)	33 (14.2)	152 (63.0)	**<0.0025***
Unilateral decrease in breath sounds	135 (28.5)	90 (38.7)	45 (18.5)	**<0.0025***
Rhonchi	84 (17.7)	61 (26.3)	23 (9.5)	**<0.0025***
Unilateral decrease in breath sounds + rhonchi	15 (3.1)	14 (6.0)	1 (0.4)	**<0.0025***
Stridor	9 (1.9)	5 (2.2)	4 (1.6)	0.68
Stridor and rhonchi	2 (0.4)	2 (0.9)	0 (0)	0.16
Rales	14 (3.0)	5 (2.2)	9 (3.7)	0.31
Intubated at admission	7 (1.4)	7 (3.0)	0 (0)	0.04
Unknown**	23 (4.8)	15 (6.5)	8 (3.3)	0.10
Consultation with Pediatric Pulmonology, n (%)				
Yes	388 (81.9)	206 (53.1)	182 (46.9)	0.059
No	86 (18.1)	50 (58.1)	36 (41.9)	

FBA: foreign body aspiration; IQR: interquartile range.
*Significant Bonferroni-adjusted p-values.
**missing interpretation of the X-rays by the physician who decided to perform rigid bronchoscopy.

Table I. Continued

	Total	Positive FBA	Negative FBA	p-value
Patients consulted with Pediatric Pulmonology, n (%)				
Total	86	50 (58.1)	36 (41.9)	0.191
Low risk, n (%)	38 (44.2)	16 (42.1)	22 (57.9)	**<0.001**
Moderate risk, n (%)	29 (33.7)	18 (62.1)	11 (37.9)	0.614
High risk, n (%)	19 (22.1)	16 (84.2)	3 (15.8)	0.057
Chest radiographs, n (%)				
Total	472	230	242	
Normal	92 (19.5)	25 (11.6)	67 (27.6)	**<0.0025***
Bilateral air trapping	6 (1.3)	3 (1.3)	3 (1.2)	0.92
Unilateral air trapping	194 (41.0)	125 (53.9)	69 (28.5)	**<0.0025***
Radiopaque objects	6 (1.3)	6 (2.6)	0 (0)	0.012
Infiltration/consolidation	11 (2.3)	1 (0.4)	10 (4.1)	0.006
Atelectasis	20 (4.2)	9 (3.9)	11 (4.5)	0.68
Other	7 (1.5)	4 (1.7)	3 (1.2)	0.68
Unknown**	136 (28.7)	57 (24.6)	79 (32.6)	0.05
Computed tomography, n (%)				
Total	27	27 (11.6)	0 (0)	
Rigid bronchoscopy findings, n (%)				
Normal	172 (36.2)	0 (0)	172 (71.1)	**<0.002***
Foreign body	232 (49.0)	232 (100.0)	0 (0.0)	**<0.002***
Secretions	43 (9.0)	2 (0.9)	41 (16.9)	**<0.002***
Purulent secretions	16 (33.7)	1 (0.4)	15 (6.2)	**<0.002***
Granulation tissue	4 (0.8)	0 (0)	4 (1.7)	0.04
Tracheal bronchus	7 (1.4)	2 (0.8)	5 (2.0)	0.61
Bronchial compression/ Malacia	4 (0.8)	0 (0)	4 (1.7)	0.04
Cast	1 (0.2)	0 (0)	1 (0.4)	0.31
Foreign body location, n (%)				
Trachea	8 (1.6)	8 (3.4)	-	
Carina	7 (1.4)	7 (3.0)	-	
Right main	100 (21.0)	100 (43.1)	-	
Right upper	2 (0.4)	2 (0.9)	-	
Right middle	2 (0.4)	2 (0.9)	-	
Right Lower	19 (4.0)	19 (8.2)	-	
Left main	77 (16.2)	77 (33.2)	-	
Left upper	4 (0.8)	4 (1.7)	-	
Left lower	8 (1.6)	8 (3.4)	-	
Both Right and Left Main	5 (1.0)	5 (2.2)	-	
Types of the foreign body, n (%)				
Unknown	21 (4.4)	21 (9.1)	-	
Organic	198 (41.7)	198 (85.3)	-	
Inorganic	12 (3.1)	12 (5.2)	-	
Tooth	1 (0.2)	1 (0.4)	-	

FBA: foreign body aspiration; IQR: interquartile range.
*Significant Bonferroni-adjusted p-values.
**missing interpretation of the X-rays by the physician who decided to perform rigid bronchoscopy.

Table II. Patient characteristics according to risk groups

	Total	Positive FBA	Negative FBA	p-value
Low risk				
Consulted with pediatric pulmonology, n (%)	38 (19.2)	16 (42.1)	22 (57.9)	**<0.001***
Not consulted with pediatric pulmonology, n (%)	160 (80.8)	9 (5.6)	151 (94.4)	
Moderate risk				
Consulted with pediatric pulmonology, n (%)	29 (20)	18 (62.1)	11 (37.9)	0.768
Not consulted with pediatric pulmonology, n (%)	116 (80)	66 (56.9)	50 (43.1)	
High risk				
Consulted with pediatric pulmonology, n (%)	19 (14.5)	16 (84.2)	3 (15.8)	0.091
Not consulted with pediatric pulmonology, n (%)	112 (85.5)	107 (95.5)	5 (4.5)	

FBA: foreign body aspiration.

Pediatric pulmonologist consultation was requested in 86 (18.2%) patients. FB was detected in 50 of 86 (58%) who were consulted by a pulmonologist. Out of the 388 patients who did not receive a prior consultation from a pediatric pulmonologist, 206 were negative for FB. In terms of FB detection rate, there was no difference between individuals who sought pulmonology consultation and those who did not (58.1% vs. 46.9% respectively, p=0.059). However, when the children were categorized based on their risk levels, the incidence of FBA among children with a low risk of FBA was 42% when they received consultation from the pulmonology department; in contrast, this incidence dropped to 5.6% when a pulmonology consultation was not sought (p<0.001). In the moderate and high-risk groups, statistically significant difference in terms of the success of FB detection was not found between those who were consulted with pediatric pulmonology and those who were not (Table II).

Discussion

Given the vague signs and symptoms seen on presentation, identifying FBA remains a diagnostic challenge. The most striking result of this study is the presence of a 51% rate of negative rigid bronchoscopy. The primary cause for this is the ongoing lack of ability to establish a clinical parameter that can consistently and reliably predict the presence of foreign objects in the airway in all cases. This study holds significant importance as a negative bronchoscopy could put patients at risk associated with general anesthesia, as well as potential complications of rigid bronchoscopy both during and after the procedure. To the best of our knowledge, this study is the first in Türkiye to assess the approach of pediatric pulmonologists in determining whether to perform rigid bronchoscopy in children with suspected FBA.

The suspicion of an FBA, particularly in pediatric patients, poses a significant challenge owing to the absence of precise and sensitive diagnostic indicators of FB. The task of developing a consistent decision-making algorithm for children who come to the emergency department with suspected FBA has been challenging due to the lack of a worldwide agreement on how to handle these patients, and the different standards of medical centers for performing rigid bronchoscopy. A missed FBA can have long-term consequences, necessitating a high level of suspicion. Bronchoscopy, on the other hand, is an intrusive procedure with potential hazards. Therefore, various scoring systems have been developed to date in an attempt to accurately predict FBA and reduce unnecessary procedures.[7-9,13] In our study, consultation by a pediatric pulmonologist was not requested in 388 (81.8%) out of 474 patients. Out of 388 patients who did not receive a prior consultation from a pulmonologist, 206 (53%) were negative for FB. Our rate of negative rigid bronchoscopy was found to be higher compared

to the literature. The literature reports a negative rate of 18% to 43% for rigid bronchoscopy, with the majority falling around 20%.[14]

In a recent study from our center, the rate of negative rigid bronchoscopy was found to be similar to ours.[8] FBA was noted in 52.1% (n=375) of 720 cases. This study was planned to create a new scoring system. The existence of FB was significantly associated with positive findings in physical examination and imaging and total FBA score. However, the patient history did not have any statistical significance in predicting positive cases. In our study, similarly, a definite history of experiencing abrupt choking while holding an object in the mouth or chewing something was collected from 204 (87.9%) and 207 (85.5%) of patients in the FB positive and negative groups, respectively.

When the children were categorized based on their risk levels, the probability of detection of FB in the low-risk group when they received consultation from the pulmonology department was 42%. In contrast, this incidence dropped to 5.6% when pulmonology consultation was not sought. Thus, the involvement of pulmonologists became apparent, particularly in infants who were in a low-risk group for FBA. We believe this is based on the clinical experience of pediatric pulmonologists. Nevertheless, the precise count of patients assessed by pulmonologists in the emergency room but not subjected to rigid bronchoscopy remains undisclosed. Therefore, the number of patients who do not undergo unnecessary rigid bronchoscopy thanks to pediatric pulmonologists is not known.

Another retrospective cohort study about scoring of FBA in children is from Israel.[12] In this study, total score based on medical history, physical examination, and chest X-ray findings were evaluated for their predictability. The study had a total of 412 children, with 154 (37.4%) diagnosed with FBA and 258 (62.6%) without FBA. The rate of negative rigid bronchoscopy was high, similar to our study. Data of children with suspected FBA who were also diagnosed with FB on rigid bronchoscopy were compared to those without FB on bronchoscopy. The findings indicated that children who were exposed to seeds/nuts, experienced stridor, had unilateral auscultatory findings (reduced breath sounds/wheezing) and displayed suggestive findings on chest X-rays (unilateral hyperinflation/atelectasis) had a notable risk of FBA. Nevertheless, cases of choking, abrupt coughing and the lack of fever and rhinorrhea did not demonstrate statistical significance in predicting FB. There were no significant changes between the groups in terms of oxygen saturation, complete blood count values and C-reactive protein levels. On the other hand, the X-ray, indicating the presence of a FBA, was statistically significant and accurate in predicting the presence of a FB.

In our study, the combination of both physical examination and radiographic findings showed higher sensitivity (94.5%) for detecting an FB. Similarly, recent studies indicate that the identification of FB is better achieved by physical examination findings and imaging results rather than relying solely on the patient's medical history. In accordance with this, the X-ray, had a strong likelihood of accurately predicting the presence of FB in one of the recent studies.[12] A recent study demonstrated that B-lines, barcode signs, pleural line anomalies, and consolidation were observed findings in lung ultrasonography of patients with FBA. The authors concluded that the value of lung ultrasound was equivalent to that of chest radiography.[15] Given the expertise of pediatric pulmonologists in this area, it is reasonable to anticipate that consulting a pulmonologist will decrease the rate of unfavorable rigid bronchoscopy outcomes.

In a very recent study, the positive predictive value of chest X-rays in children hospitalized with suspected FBA was assessed by three disciplines: pediatric pulmonology, pediatric radiology, and pediatric residents.[16] In this study, chest X-ray was found to have a high positive predictive value, as an independent

parameter, in predicting FBA in children. However, it had different predictability, when interpreted by pediatric residents, pediatric radiologists, and pediatric pulmonologists, even among physicians from the same discipline. By evaluating a chest X-ray, pediatric pulmonologists had the highest positive predictive value of diagnosing FBA, followed by pediatric residents and pediatric radiologists.

Based on a comprehensive meta-analysis of more than 1000 studies conducted in various countries between 1978-2008, children under the age of 3 constituted a minimum of 60% of the FBA cases.[17] In line with the literature, the median age of children whose rigid bronchoscopy was positive for FB was 20 months in our study. Additionally, 81.6% of these children were under the age of 3.

A greater number of cases were detected in male patients, and the overwhelming majority of aspirated foreign bodies were composed of organic matter.[17] The frequency of detection of foreign bodies was greater in the right lung compared to the left, predominantly in the mainstem bronchi.[18] Consistent with the literature, organic substances constituted the most commonly detected FB in our patients, with a higher prevalence observed in the right lung.

In our study, consistent with the literature, a cough that started after the witnessed event and subsequent rhonchi were the most common findings in children with FBA. On physical examination, breath sounds were normal in 63% and 14.2% of patients without FBA and with FBA, respectively. Decreased breath sounds and rhonchi were noted in 71% of children with FBA. FB was absent in 82.1% of patients who had a normal physical examination, while FB was present in 17.8% of patients with a normal physical examination. As a result, the patients with FBA were found less likely to have a physical examination without any respiratory findings.

The most important limitation of our study was its retrospective nature. In addition, the process of history taking and physical examination were subject to the individual interpretation of the physician and certain findings like interpretation chest X-rays by the physicians were missing.

In conclusion, this study is significant because it highlights how various disciplines contribute to FB diagnosis. Pediatric pulmonologists play a significant role in decreasing the incidence of negative rigid bronchoscopies in patients with low risk of having FB. However, further studies, especially prospective randomised controlled trials, are necessary to develop new algorithms to avoid negative bronchoscopies.

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Ethical approval

The research protocol for this study was approved by the Clinical Research Ethics Committee of Hacettepe University (date: 03.10.2023, number: SBA 23/186).

Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: BS, NK; data collection: BS, HNB, İG, DA, MAE, HİD, RA, BCY; analysis and interpretation of results: BA, İRU, OT, EY, NE, DD, UÖ, NK; draft manuscript preparation: BS, NK All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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