Original Research Article

Foreign body aspiration in the pediatric population in Kuwait: experience of 901 cases

Abstract:

Objective: The aim of this study is to report chest diseases hospital experience with foreign body aspiration in pediatric age group. Methods: we conducted a retrospective review of the data of all pediatric patients <18 years of age who underwent flexible and rigid bronchoscopy for suspected foreign body aspiration. Data was collected from a national tertiary center in Kuwait from 2009 until 2015. A total of 901 patients underwent rigid bronchoscopy for suspected foreign body aspiration. Foreign body aspiration was identified in 403 (44.7%) patients. History of choking, witnessed aspiration, respiratory distress, stridor, positive finding on chest x-ray and auscultation were significantly associated with positive bronchoscopy. Conclusion: detailed history, physical examination, radiological finding can be utilized to aid in the diagnosis of foreign body aspiration and prevent complications.

Keywords: Bronchoscopy, Foreign body, Thoracic, Respiratory

Introduction:

Foreign body aspiration is a significant cause of morbidity and mortality in pediatric age, most commonly between 0-3 years[1,2,3]. Most of the foreign bodies are organic in origin, which induce inflammation and edema in the airway[4,5]. Foreign body aspiration is a serious condition during childhood that requires immediate management to keep away complications and irreversible lung injuries . Tracheobronchial foreign body aspiration is life-threatening emergency for children and comprise the majority of accidental deaths in childhood [19, 20]. After tracheobronchial foreign body aspirations, cardiopulmonary arrest and sudden death may be seen in patients, especially in children[21,22]. The aim of this study is to present our experience with pediatric foreign body aspiration which led to identify chest diseases hospital (CDH) criteria for referral of suspected foreign body aspiration cases[6].

Methods:

Procedure

Flexible bronchoscopy performed under general anesthesia for the diagnosis and identification of the foreign body. Following the confirmation of the presence of foreign body a ventilating rigid bronchoscopy is used with the assistance of a forceps to remove the foreign body. Detailed technique described

by Armin Ersnt et al17. Success rate was 100% in the extraction of the foreign body in the confirmed cases with same discharge home. Foreign bodies extracted, includes organic meterials such as nuts, plastic pieces, and sharp needles.

Study design

A retrospective review was conducted of all pediatric patients age <18 years who underwent rigid bronchoscopy for suspected foreign body aspiration. Data were collected from clinical records of national tertiary center in Kuwait from January 2009 until December 2015. Demographic data, presenting symptoms, physical examination, chest x-ray, and bronchoscopy findings were obtained.

Statistical analysis

Statistical analysis was performed using SPSS statistical package version 25. Univariate analysis with chi-square test followed by analysis of variance was done to evaluate the yield of presenting symptoms, physical examination, and radiological findings in the diagnosis of foreign body aspiration. Logistic regression was used to identify the factors associated with positive bronchoscopy for foreign body.

Results:

Frequency and percentage of age, gender, presentations, auscultation, and positive bronchoscopy were calculated (table 1). A total of 901 patients was involved in the study with mean age of 42.8 +_ 45.7 months. Highest percent in the age subgroup was between 0-24 months (52%). 516 cases were male (57.3%). Positive bronchoscopy was in 403 cases (44.7%). In regard to presentation, most common was cough in 91% of cases; followed by witnessed aspiration (78.6%), history of chocking (30.1%), stridor (16.6%) and respiratory distress (15.5%). In 57.6% of the cases, auscultation of the chest showed nor abnormality, while the remaining had decreased air entry (22.1%), rhonchi (14.4%), and crackles (5.9%).

Table 2 shows CXR findings associated with patients suspected with foreign body aspiration. For patients underwent bronchoscopies, majority of the chest x-ray did not show any abnormities. About 30.4% of the x-rays showed chest hyperinflation. Radiopaque foreign body was seen in only 4.4% of the chest x-ray. Remaining of the findings was consolidation/infiltration (7.6%), pleural effusion (1.2%), and atelectasis (0.8%).

Table 3 reports sites were foreign body was found in positive bronchoscopies. The most common site of foreign body was found in the right main bronchus (33.4%). Second most common site of foreign body was in right lobar bronchus. Other locations were trachea (18.3%), left main bronchus (17.1%), left lobar bronchus (9.2%), and larynx (2.5%).

The association between positive bronchoscopy and presentation was further investigated (table 4). Six factors were found to be associated with positive bronchoscopy. Stridor, history of chocking, witnessed aspiration, respiratory distress, positive finding on auscultation or chest x-ray were the parameters that found to be statistically significant with a p value <0.01.

Association of positive bronchoscopy and chest x-ray finding was analyzed further using logistic regression. Tables 4 and 5 show the results of the analysis and logistic regression. Radio-opaque foreign body was strongly associated with positive bronchoscopy p value <0.001. In addition, chest x-ray showing hyperinflation showed statistical significant (p = <0.024). Consolidation/infiltration and pleural effusion were not associated with positive bronchoscopy.

Discussion:

This retrospective review assessed chest disease hospital experience from 2009-2015 with suspected foreign body aspiration in pediatric age group and the factors associated with positive bronchoscopy. As the chest diseases hospital is the only center in Kuwait that provides service for the management of foreign body aspiration. High volume of suspected foreign body aspiration cases referred to undergo bronchoscopy as diagnostic and therapeutic intervention. Most bronchoscopies are done on urgent or emergent bases. Boufersaoui et al

found an increase in the prevalence of the total number of foreign body aspirations cases. They reported the increase during 24 years follow-up rising from 123 cases 1989-91 to 655 2010-2014. This data raises the necessity to define a criteria to categorize the severity and the urgency to perform bronchoscopy in suspected foreign body aspiration cases. The presented data led to found novel criteria for referral of suspected cases of foreign body to facilitate prompt intervention in emergency cases and conserve resources for less urgent cases[6].

Diagnosis of foreign body aspiration has been proved historically to be difficult to diagnose. A careful and thorough history is required to provide accurate diagnosis of foreign body aspiration[8,9]. Bronchoscopy confirmed the suspected foreign body in 44.7% of the cases. This is less than what was found in a study done by Mnejja et al (57.4%)10, Haddadi S (71.8%)[16] and Orji et al (82.5%)[4].

Clinical signs and radiological findings are essentials to avoid missing cases of foreign body aspiration, especially in the cases of unwitnessed aspiration8. Univariate analysis showed association between clinical presentation and positive bronchoscopy except for cough. Similar association was reported by Orji et al[4].

The most common location of lodged foreign bodies is right side of the bronchus (53%), mainly in the right main bronchus (33.4%). Similar finding

reported by Erici et al, Eren et al, and Oncel et al with percentage 57.5, 59.6, 51 respectivly[3,11,12]. This is attributed to the anatomical angle of right bronchus, which is shorter and wider[14].

Radiological findings are critical in confirming the suspicion of foreign body aspiration specifically radio-opaque material. From the 901 cases underwent bronchoscopy, 501 (55.6%) of CXR didn't show any abnormalities among all cases suspected with foreign body aspiration and 110 (27.2%) of the positive bronchoscopy cases had normal CXR. As previously reported by Sousa[15], only 25.3% of the positive bronchoscopies had normal chest x-ray; However, Erikci et al reported that most of the confirmed foreign body aspiration cases had normal Chest x-ray[11]. Hyperinflation and air trapping were the most common finding in the chest x-rays in patients suspected with foreign body aspiration. Similar finding was reported by Baharloo et al, who found air trapping in 64% of cases[7]. Our analysis showed statistical significance between hyperinflation and positive foreign body aspiration. Furthermore, Radio-opaque foreign body notes in the chest x-ray is the most specific finding associated with positive bronchoscopy (p value <0.001). Therefore, having an unremarkable CXR doesn't exclude the presence of foreign body.

Conclusion:

Foreign body aspiration most frequently occurs in children <2 years of age. Early diagnosis utilizing history, physical examination, imaging, and urgent rigid bronchoscopy is crucial to reduce the complications. Most of the urgent bronchoscopies done are negative, thus the need for adaptation of CDH criteria is necessary to reduce the unnecessary urgent rigid bronchoscopies.

Ethical approval

Ethical approval was received from the Ethics Board of the Chest diseases hospital and ministry of health in Kuwait.

Consent

Written informed consent was obtained from the patients' parents for publication of this case report and any accompanying images.

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Table 1: Age, gender, and clinical features of the patients

	Frequency	%
Age (months)		
0-24	475	52
25-60	236	26
61-120	132	14.7
>120	58	6.4
Mean (+_ SD)	42.8 (45.7)	
Gender		
Male	516	57.3
Female	385	46.7
Positive Bronchoscopy	403	44.7
Presentation		
Cough	820	91
Witnessed Aspiration	708	78.6
History of choking	271	30.1
Stridor	150	16.6
Respiratory distress	140	15.5
Auscultation		
Normal	519	57.6
Decrease air entry	199	22.1
Rhonchi	130	14.4
Crackles	57	5.9

Table 2: percentage of radiological Finding in patients underwent bronchoscopy

	n%
Normal	55.6
Hyperinflation	30.4
Consolidation/infiltration	7.6
Pleural effusion	1.2
Radio-opaque foreign body	4.4
Atelectasis	0.8

Table 3: Site of the foreign body

	n%
Larynx	2.5
Trachea/carina	18.3
Right main bronchus	33.4
Right lobar bronchus	19.6
Left main bronchus	17.1
Left lobar bronchus	9.2

Table 4: Association between positive bronchoscopy and presentation

	Positive bronchoscopy	n%	P value
Gender			
Male	241	59.9	0.167
Female	162	40.1	
Cough			
Positive	362	89.8	0.264
Negative	41	10.2	
Respiratory distress			
Positive	110	272	0.001
Negative			
Stridor			
Positive	110	27.2	<0.001
Negative	293	72.7	
Witnessed Aspiration			
Positive	360	89.3	0.01
Negative	43	10.7	
History of choking			
Positive	196	49	0.001
Negative	204	51	
Auscultation			
Normal	145	36	0.001
Decreased air entry	170	42.3	
Rhonchi	81	20	
Crackles	7	1.8	
Chest x-ray			

Normal	110	28	<0.001
Hyperinflation	234	59.5	
Consolidation/infiltration	6	1.5	
Pleural effusion	3	0.8	
Radio-opaque foreign body	35	9.7	
Atelectasis	2	0.5	

The numbers may not add up to total due to missing data. P value generated using person's X^2 test.

Table 5: Logistic regression of positive bronchoscopy according to chest x-ray finding

	p-value
Normal	0.452
Hyperinflation	0.024
Consolidation/infiltration	0.146
Pleural effusion	0.563
Radio-opaque foreign body	<0.001