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Tracheobronchial foreign body aspiration in children: A continuing diagnostic challenge

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ABSTRACT

Background: Foreign body aspiration (FBA) is a common cause of respiratory compromise in early childhood. The objective of this study was to describe the features and outcomes of children with FBA in early and late presentations and to examine the reasons for the delay in diagnosis. **Patients and Methods:** This is a retrospective review of all children who were admitted with suspected FBA between July 2001 and June 2010. Patient's characteristics, history, clinical, radiographic, bronchoscopic findings, reason for delay presentation, and complications were noted. **Results:** A total of 158 children admitted to the hospital with suspected FBA were included in this study. The average age was 3.28 years. Forty-eight (30.3%) children were presented late (more than 14 days after FBA) and 110 (69.7%) children were presented early (0–14 days). The common clinical manifestations of FBA were persistent cough (100%) and choking (72%). The most frequent radiological finding observed was air trapping (40%) followed by atelectasis (14%). Chest radiographs were normal in 32.2% patients. Ten children in early diagnosis group and 29 children in late diagnosis group presented with complications. The diagnosis delay was mainly attributed to physician misdiagnosis (41.6%). Rigid bronchoscopy was performed in all patients. Foreign body was found in all of the cases except six. Watermelon seeds and peanuts accounted for 80% of the aspiration. **Conclusion:** FBA is difficult to diagnose in children. Delay in diagnosis appears to result from a failure to give serious consideration to the diagnosis. Early diagnosis and removal of foreign bodies must be achieved to avoid complications.

Key words: Aspiration, bronchoscopy, complications, foreign bodies, signs and symptoms

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INTRODUCTION

Foreign body aspiration (FBA) is a dramatic event with serious and potentially lethal sequelae. In many children, an early diagnosis of FBA is not made.[1] The problem, to which Jackson[2] referred as the overlooked diagnosis, continues to be unsolved. Aspirated foreign bodies are responsible for a significant amount of morbidity and mortality in children. Delayed diagnosis of FBA is associated with increased incidence of complications.[3-5] Mu *et al*.[3] in their study have reported a complication rate of 64%, when diagnosis of FBA was made within 4-7 days and 95% in the cases of delayed diagnosis of more than 30 days. To prevent complications and death due to FBA, it is vital to diagnose and remove foreign material promptly. The tracheobronchial foreign bodies are best managed by rigid bronchoscopy. The success within foreign body extraction depends on the expertise of the bronchoscopist and anaesthesiologist.

The objective of this study was to identify specific or coincidental diagnostic symptoms and signs that indicate potential FBA in children, complications and outcomes of children with FBA in early and late diagnosis, and to examine the reasons of delay in diagnosis.

PATIENTS AND METHODS

This is a retrospective review of all children who underwent rigid bronchoscopy to exclude or remove tracheobronchial foreign body from July 2001 to June 2010. The record of each patient was reviewed for the following information: Age, and gender, presenting symptoms, duration of symptoms, findings of physical examination, appearance of chest radiography, results of bronchoscopy and complications. The length of hospital stay, morbidity due to late presentation (>14 days) and reason for late presentation were also reviewed.

Bronchoscopy was performed in the operating room under general anaesthesia and using a ventilating bronchoscope. A rigid paediatric bronchoscopic system with an optical telescope (Karl Storz, Germany) was used in all cases. Once the foreign body was removed, the telescope was re-inserted to check the retained or missed foreign body and to assess the severity of mucosal reaction and damage. In procedures where there was intense manipulation, corticosteroids were administrated for 48 h. Where secretions were purulent or there were signs of infection or the foreign body had been in the bronchial tree for a long time, antibiotics were also given.

RESULTS

During the study period, 158 children underwent rigid bronchoscopy for either exclusion or confirmation of FBA. Their mean age was 3.20 years (range 9 months to 12 years) and 55% of the children were 3 years old or younger [Table 1]. Ninety-seven children (61.4%) were boys and 61 (38.6%) were girls. Duration of symptoms ranged from <12 h to 3 months, 36.8% of children had symptoms for 1-3 days and 30.3% had symptoms for more than 2 weeks [Table 2]. The signs and symptoms associated with FBA in children are shown in Table 3. The most common symptoms noted were cough (100%) and choking (72%). The most frequent signs were diminished breath sound (66.4%) and rhonchi (43%). Twenty one (13.2%) had no abnormalities on physical examination. The clinical triad, wheezing, coughing, and diminished breath sound was present in 38% of children. Chest radiographs were completely normal in 51 (32.2%) patients. The most frequent radiological finding observed was air trapping (40%) followed by atelectasis (14%) and consolidative changes (10.1%). A radio-opaque foreign body was found in 6 (3.8%) children.

In 48 (30.31%) children, FBA was diagnosed late (more than 14 days). The diagnostic delay was due to misdiagnosis by physicians (n = 20), due to parent's negligence (n = 10), parents left against medical advice (n = 7), and cause of delay was unknown in remaining 11 children.

The foreign bodies were successfully identified and removed by bronchoscopy in 152 (96.2%) children. In 6 (3.8%) children, no foreign body was found. However, signs of foreign body, (inflammation, granulation tissue, bleeding on touch and localized thickening of the bronchus) were present. Repeat bronchoscopy was needed in two patients because the foreign body was removed in pieces. A variety of foreign bodies were retrieved [Table 4] but watermelon seeds were the most common accounting for 55 cases of all foreign bodies. The foreign body was located in the right main bronchus in 89 patients, in the left main bronchus in 54 patients, at carina in five patients and in both bronchi in four patients.

Table 1: Age of children with foreign bodies in the airway

Age (years)	Number of patients (%)
<1	5 (3.2)
1-3	82 (51.8)
3-6	47 (29.8)
6-9	15 (9.5)
9-12	9 (5.7)

Table 2: Duration of symptoms in children with FBA

Symptom duration	Number of patients (%)
<12 h	12 (7.6)
12-24 h	17 (10.8)
1-3 days	58 (36.8)
3-7 days	13 (8.2)
1-2 weeks	10 (6.3)
2-12 weeks	48 (30.3)

FBA: Foreign body aspiration

Table 3: Clinical presentation

Clinical features	Number of patients (%)
Symptoms	
Cough	158 (100)
Choking	114 (72)
Wheeze	54 (34)
Stridor	27 (17)
Dyspnea	45 (0.8)
Physical findings	
Diminish air entry	105 (66.4)
Rhonchi	68 (43.0)
Fever (temperature >380°C)	25 (15.8)
Crepitation	20 (12.6)

Table 4: Type of foreign body

Foreign body	Number of patients (%)
Organic	
Watermelon seeds	84 (55)
Peanuts	38 (25)
Dried bean	6 (3.9)
Orange peel	2 (1.3)
Piece of carrot	1 (0.6)
Inorganic	
Plastic toe pieces	15 (9.8)
Small metal pieces	4 (2.6)
Nail	1 (0.6)
Stone	1 (0.6)
Total	152

Longer than 2 weeks delay in diagnosing of FBA resulted in a significant incidence of complications. Twenty-nine (60.4%) children of late diagnostic group presented with the complication that included pneumonia (n = 12), atelectasis (n = 9), and bronchiectasis (n = 8).

Eight (7.2%) children in early diagnostic group (0-14 days) had complications (six pneumonia, two atelectasis). All the complications due to FBA were treated conservatively with antibiotics and chest physiotherapy after removing the foreign bodies. Post-bronchoscopy complications occurred in five children. The complications included bronchospasm (n = 3), pneumonia (n = 1) and subglottic oedema (n = 1). All these complications were in children who presented late. These complications were successfully treated using bronchodilators, steroids, antibiotics. There were no deaths in this series. Average hospital stay was 2 days (1-3 days) in early presentation group and 4 days (2-7 days) in late presentation group.

DISCUSSION

Foreign body aspiration is one of the major causes of persistent respiratory symptoms in children, yet is commonly missed by physicians. Early diagnosis and removal of foreign bodies must be achieved to avoid complications. Diagnosis of foreign body in the airways is still a challenge for the physicians. Only bronchoscopy gives certainty about the diagnosis.[6]

Diagnosis largely depends on the first physicians to see the patient because clinical history is the most important element to make diagnosis of FBA. In the literature, history has been considered an important diagnostic method.[7-9] A witnessed episode of choking is considered to be an important component of the history that leads to the correct diagnosis of aspiration. A history of choking episode can usually be obtained from parents or caretaker. Such history was obtained in 114 (72%) children in our series. The absence of choking episode does not rule out FBA and may be a risk factor for diagnostic delay.[10] Ten (20%) children out of 48, who presented late had no history of choking in our series. The clinical symptoms and signs of FBA depend on type, location, and size of the foreign body, as well as on the duration and the degree of obstruction.[11] In our patients, the most common symptom was cough (100%), followed by choking (72%) and wheeze (34%). There were no abnormal findings on physical examination in 21 (13.2%) of our patients. Soysal *et al*.[12] have reported normal physical examination in 21% of his patients with FBA. In our series, most frequent physical findings were decreased air entry (66.4%) and rhonchi (43%), which is in agreement with many other studies.[12,13] The typical clinical trial of wheezing, coughing and decreased air entry is reportedly present in about 40% of children with FBA.[14,15] In our series, it was present in 38% of children. The value of chest radiography in making a diagnosis of FBA remains controversial. A high percentage of children with FBA have completely normal radiological findings.[16,17] Schmidt and Manegold reported normal chest X-ray in 16% of their patient[4] and Baharloo *et al*.,[14] in 12% of their patients with FBA. In our series, we found normal chest X-ray in 32.2% of patients. Conversely, Vane *et al*.[15] reported that 97% of the chest X-ray performed in children with FBA were diagnostic or at least suggestive of FBA. However, a plain X-ray is helpful in diagnosis when they show the findings of obstructive emphysema, atelectasis, pulmonary infiltration or radio-opaque foreign body.[16,18,19] The most common radiological sign in our series was obstructive emphysema (40%). This is in agreement with other studies.[13,19] A normal chest X-ray does not always exclude the diagnosis of FBA in children. Therefore, a negative radiological finding should not preclude bronchoscopy in patients with a history of suggestive FBA. A delay in diagnosis of FBA is not unusual. In 48% of our patients, the diagnosis was made more than 2 weeks after aspiration. Other investigators have reported a similar incidence of delayed diagnosis.[20,21]

In our series, late presentation was due to physician misdiagnosis in 41.6% and in 20.8% due to parent's negligence. To avoid misdiagnosis, physician should be aware that FBA in one of the differential diagnosis in children with symptoms of respiratory tract infection and asthma. The morbidities and complications related to FBA and bronchoscopy were more in children who presented late. In our study, 7.2% children with early presentation and 60.4% in children with late presentation had complications that include pneumonia, bronchiectasis and atelectasis. Tomaske *et al*.[10] observed similar findings in children with delayed diagnosis. Late presentation also endured longer hospitalisation as well as bronchoscopy related laryngeal oedema, bronchospasm, and pneumonia.[9,17,22] Five children in late diagnosis group and none in early diagnosis group in our series developed complications related to bronchoscopy. Early bronchoscopy is essential to reduce the morbidity associated with the complications of prolonged foreign body retention.

Rigid bronchoscopy under general anaesthesia is regarded as the procedure of choice for the removal of aspirated foreign bodies.[6,7,20,22] Advances in

paediatric bronchoscopic instruments and techniques allow for safe ventilation and manipulation under direct vision. Careful monitoring of these children is continued throughout the procedure. In our study, 152 (96.2%) patients had foreign bodies removed by rigid bronchoscopy. Barrios Fontoba *et al*.[23] suggested that bronchoscopy should be performed in all children with a history of choking crisis. We believed that a substantial number of negative bronchoscopies will be required to ensure that no foreign body has been overlooked. In our series, there were 6 (3.8%) negative bronchoscopy. Hasdiraz *et al*.[22] has 12% negative bronchoscopy in a series of 1035 foreign body cases.

Most of the foreign bodies encountered in our patients were organic in origin. Watermelon seeds (55%) were by the far the most commonly inhaled foreign body, unlike Western countries, where peanuts are the most commonly encountered foreign body.[10,13,23]

CONCLUSION

Diagnosis of FBA in children is still a challenge for physicians. Delay in diagnosis appears to result from a failure to give serious consideration to the diagnosis. Medical history is the key for the diagnosis of FBA. Choking and cough are the most common presentations of FBA. Most complications arise due to delayed diagnosis. Physicians taking care of children should be alerted to the importance of history taking in the diagnosis of FBA. They should exercise a high index of suspicion in cases presenting with choking or coughing of sudden onset. Normal appearance of chest X-ray does not exclude the possibility of FBA. Early bronchoscopy is essential to reduce the morbidity associated with the complications of prolonged foreign body retention.

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