TJTES
TURKISH JOURNAL OF TRAUMA
& EMERGENCY SURGERY

Ulus Travma Derg. 2003 Jan;9(1):45-49

FOREIGN BODY ASPIRATION: A FOUR-YEARS EXPERIENCE *

Volkan ERİKÇİ, MD, Şafak KARAÇAY, MD, Ahmet ARIKAN, MD

ABSTRACT

Background: *Foreign bodies (FB) in the airway require prompt removal in children. We reviewed our experience in patients with suspected airway FB.*

Methods: *A retrospective study was conducted in 189 consecutive children who admitted to the Department of Pediatric Surgery, SSK Tepecik Training Hospital between 1997-2001. Patients data on presentation, bronchoscopy findings and results were obtained. Of the 189 bronchoscopies, 127 (67.2%) showed FB which are commonly located in the right mainstem bronchus. Most of FB were non-radiopaque. Pips and hazelnuts were the most common FB. Mean hospital stay was 2.5 days. Many patients (151 out of 189; 79.9%) had transient stridor or fever that ceased within 24 hours after bronchoscopy. No mortality was observed rin relation with bronchoscopy.*

Conclusion: *Chest radiographs of the children with FB in the airways are inconclusive. Children with a history of small particles in their mouths and subsequently showing wheezing, or choking episode should undergo prompt bronchoscopy. Complications related to bronchoscopy are uncommon.*

Key words: *Foreign body aspiration, bronchoscopy*

INTRODUCTION

There is a wide range of clinical problems in children who are susceptible to aspirate (1). Foreign bodies (FB) that pass through the larynx usually end up in one of the bronchi and seldom cause life-threatening hypoxia. Rarely, however, an object may be too large to enter a bronchus and a life-threatening tracheal obstruction may occur (2). Fortunately, most bronchial FB do not cause severe symptoms. If they have been in place long enough, the symptoms related to secondary infection and pneumonia may be observed. FB aspiration is one of the major causes of injuries during childhood in our country and the exact number of deaths due to FB aspiration is not known accurately (3-7). But it is estimated that, up to 1000 children die yearly in USA because of FB aspiration (8).

In the management of these patients, unnecessary bronchoscopies should be awoided. On the other hand, if the patients need endoscopic removal, there should not be a delay. In this report, we reviewed the experience with pediatric airway FB to examine our focus on these patients.

MATERIALS AND METHODS

The charts of all patients, who underwent bronchoscopy for suspected airway FB from 1997 through 2001 at the Department of Pediatric Surgery, SSK Tepecik Training Hospital, were reviewed retrospectively with respect to age, symptoms, type and anatomic location of FB, length of hospital stay and complications. All bronchoscopies were performed by the same surgical team with a rigid bronchoscope (Karl Storz Endoscopy-America) under general anesthesia. FB were removed with FB forceps. Endoscopic removal was deferred for a period of 2-3 hours for the stomach to empty, lessening the risk of aspiration under anesthesia. In the postbronchoscopy period, all the children were observed in recovery unit and given vapor for 24 hours.

RESULTS

Of the patients, 105 (55.5%) were male, and 84 (44.5%) were female and the mean age was 2.7±2.12 years. Majority of the patients (136 cases, 72%) were between 1-3 years. Choking was the most common symptom leading to bronchoscopy. Other symptoms are shown in Table 1. Radiography was obtained in all patients prior to bronchoscopy. Chest films of the patients with aspiration of radio-opaque materials were found to be diagnostic (Picture 1,2). Although 22 (11.6%) patients had unilateral lung emphysema or air trapping (Picture 3), and 10 (5.3%) had upper lobe atelectasis or pneumonia, majority of the patients had normal radiographs (Picture 4). Of the 189

bronchoscopies, 127 (67.2%) showed FB which commonly located in the right mainstem bronchus (Table 2). Most of FB were non-radiopaque, pips and hazelnuts were found most commonly (Table 3). The other 62 (32.8%) had normal bronchoscopy. Mean hospital stay was 2.5 days. One hundred and fifty-one patients (79.9%) had transient stridor or fever that cleared within 24 hours after bronchoscopy. Neither serious complications nor mortality was observed related to bronchoscopy.

DISCUSSION

Foreign body aspiration is a preventable accident with high risk of mortality and morbidity. It is a significant health hazard in young children, particularly between the ages of 1 and 4 years with a male predominance (5, 7-9). In this period of age, the child is eager to percept the environmental objects and the ambulatory preschooler is often unobserved in the houses by the parents. As infants spend most of their time in home, most FB aspirations occur there while eating or playing with small objects. This is an important but not the only mechanism of FB aspiration in children. Besides, it is not unusual in our society for a child to aspirate while his parents feed him with particulate matters such as pips, hazelnuts, etc. So the parents or care-givers must be advised on avoiding foods and non-food objects that infants and toddlers are likely to choke.

There is an attitude of urgency regarding the removal of aspirated foreign bodies, partly because a large number of deaths have been reported previously on this issue (10). Harris et al. reported that actual number of deaths from food asphyxia was about 75 annually (11). Fortunately, it is extremely rare for a large object pass through the narrow diameter of cricoid cartilage and lodge in to the larynx (2). Nevertheless once in the larynx or trachea, larger objects constitute true emergencies and must be removed immediately. Although there were 14 patients presented with tracheal foreign objects in our series, we did not perform any true emergent bronchoscopies. The reason way that these objects were not too large to cause total obstruction of the tracheal lumen and suffocation.

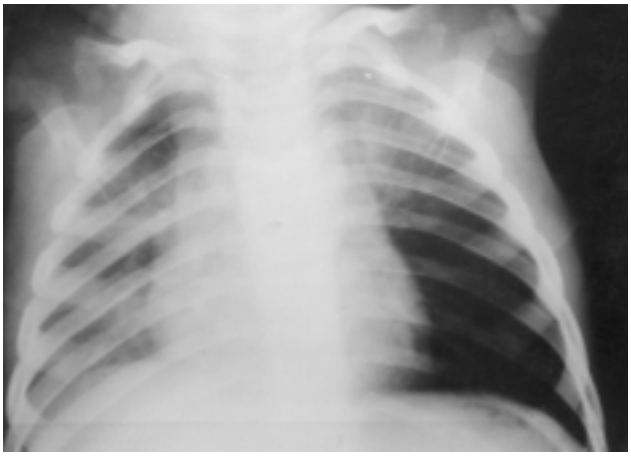
Picture 1. Chest x-ray shows a pin in the right mainstem bronchus

The problems are compounded in children because there may be no specific history of aspiration. However, the parents may report that their children exhibited particles of what they

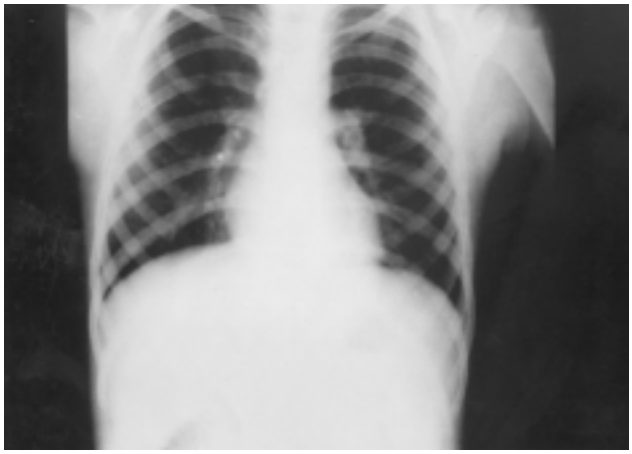
Picture 2. Chest x-ray shows a ball-point pen tip in the left mainstem bronchus

Table 1. Symptoms of aspirated airway foreign bodies

	n (%)	Choking episode n (%)	Wheezing n (%)	Coughing n (%)	Acute dyspnea n (%)
FB (+)	127 (67.2)	74 (39.1)	24 (12.7)	65 (34.4)	6 (3.2)
FB (-)	62 (32.8)	8 (4.2)	4 (2.1)	10 (5.3)	4 (2.1)
Total	189 (100)	82 (43.3)	28 (14.8)	75 (39.7)	10 (5.3)



Picture 3. X-ray of a patient showing unilateral air trapping



Picture 4. Normal chest x-ray in a patient suspicious for foreign body aspiration

Table 2. Location of the aspirated foreign bodies

Location of FB	Right mainstem	Left mainstem	Trachea	Segmental left lower lobe	Segmental right lower lobe
n (%)	73 (57.5)	34 (26.8)	14 (11)	4 (3.1)	2 (1.6)

aspirated on their lips, and transient cyanosis (12). Many of the parents in our series gave a medical history of suspicion for their offsprings to aspirate. A choking episode with an incidence of 22%, 70% and 80% was reported by Burton, Moazam and Wiseman, respectively (13-15). Choking episode was the most common symptom with an incidence of 58% in this series with positive bronchoscopies. On the other hand eight patients with no foreign objects in the airways also presented with a choking episode. This finding is also true for other symptoms in our patients. Therefore symptoms in these children are conclusive but not diagnostic.

Table 3. Foreign bodies

Non-radiopaque FBs	n	%
Pip	52	40.9
Hazelnut	23	18.1
Walnut	9	7.1
Paper	7	5.5
Chestnut	7	5.5
Chickpea	6	4.7
Stone	5	3.9
Threat	4	3.1
Meat	4	3.1
Bean	3	2.4
Radiopaque FBs	**n**	**%**
Needle	4	3.1
Hair pin	2	1.6
Ball point pen tip	1	1

A simple chest film is rarely helpful in the diagnosis of a foreign body in the bronchus (5). In the case of radiopaque object aspiration, direct chest x-rays may be diagnostic as way the case in seven of our patients. Radiolucent objects (32 patients in our series) may still provide clues such as unilateral lung emphysema or air trapping in partial obstruction; atelectasis or pneumonia in total obstruction of the bronchus. Majority of the patients in this series revealed normal radiographs and this finding contrasts with Black et al. (8). In their series of 440 patients with airway foreign bodies, 9% were found to have normal radiographs. This may be explained by the fact that radiographs of patients with airway foreign bodies can display noncharacteristic abnormalities. On the other hand, false negative radiographs are also common. Therefore, negative radiological findings should not preclude bronchoscopy in patients with characteristic symptoms.

Bronchoscopy is used for both diagnostic and therapeutic purposes in the care of these infants and children. Pediatric bronchoscopes are available as both flexible and rigid instruments. Despite the increasingly widespread use of

flexible bronchoscope (16-19), the rigid bronchoscope remains an important instrument for the evaluation of the pediatric airway. Many centers still use the rigid instrument exclusively in infants and children, and the pediatric surgeon should be familiar with its capabilities and limitations (20,21). Rigid bronchoscopy is specifically indicated for the removal of foreign bodies. The use of flexible bronchoscopes has been reported as an adjunct in assessing for the presence of foreign bodies (16-19). It is cautioned that provisions be made to provide immediate rigid bronchoscopic management if the attempts at flexible bronchoscopic extraction fail (16), but this practice of extraction with flexible instruments is generally discouraged because rigid bronchoscopy is always required for removal of the foreign body (22). It is believed that the use of both techniques -the flexible instrument for diagnostic purposes and the rigid instrument for FB removal- provides optimum care for children with suspected FB.

Significant complications of flexible and rigid bronchoscopy are uncommon but may include hypoxia, hypercapnia, bradycardia, laryngospasm, pneumothorax, mediastinal air, and hemoptysis (1,22,23). Minor complications are laryngeal or subglottic edema. Many of our patients (151 out of 189; 79.9%) had transient stridor or fever that cleared within 24 hours after bronchoscopy. None of the patients necessitated a thoracotomy for removal of a bronchial foreign object. Neither serious complications nor mortality were observed related to bronchoscopy.

In conclusion, chest radiographs are inconclusive in children with FBs of the airway and can display noncharacteristic abnormalities for FB aspiration. The index of suspicion of FB aspiration should be high whenever a choking crisis is present in the patient's history, or when the child suffers from chronic pulmonary infections. A prompt bronchoscopy should be performed, investiyating for a FB without relying on other diagnostic tools. Rigid bronchoscopic extraction of pediatric FB can be performed safely with minimum risks and complications. Complications related to bronchoscopy are uncommon.

REFERENCES

1. *Tucker GF. Foreign bodies in the air passages and esophagus. In: Raffensperger JG, ed. Swenson's Pediatric Surgery. New York: Appleton & Lange;1990: 763 - 767.*

2. *Johnson DG. Malformations and obstructions of the airway. In: Ashcraft KW, Holder TM, eds. Pediatric Surgery. 2nd ed. Philadelphia: W.B. Saunders Company; 1993: 170.*

3. *Başoğlu A, Ceviz M, Karaoğlanoğlu N, et al. Trakeobronşial yabancı cisimler: 166 olgunun analizi. Göğüs Kalp Damar Cerrahisi Dergisi 1997; 5: 52.*

4. *Yalçınkaya İ, Kaya S, Çetin G. Trakeobronşial yabancı cisimler: 177 vakalık bir çalışma. Gülhane Askeri Tıp Akademisi Bülteni 1996; 38: 101.*

5. *Özcan N, Durak AC, Karahan Öİ, et al. Çocuklarda trakeobronşial yabancı cisimlerin tanısında direct göğüs radyogramlarının değeri. Tanısal ve Girişimsel Radyoloji 1995; 1: 231.*

6. *Köseoğlu B, Bakan V,Demirel B, et al. Çocuklarda tanısal ve tedavi amaçlı bronkoskopi. Solunum 1999; 1: 117.*

7. *Öz N, Sarper A, Erdoğan A, et al. 0 - 3 yaş grubu trakeobronşiyal yabancı cisim aspirasyonları: 575 olgunun analizi. Solunum Hastalıkları 1999; 10: 249.*

8. *Black RE, Johnson DG, Matlak ME. Bronchoscopic removal of aspirated foreign bodies in children. J Pediatr Surg 1994; 29: 682 - 684.*

9. *Metrangolo S, Monetti C, Meneghini L, et al. Eight years' experience with foreign-body aspiration in children: what is really important for a timely diagnosis? J Pediatr Surg 1999; 34: 1229 - 1231.*

10. *Benjamin B, Vandeleur T. Inhaled foreign bodies in children. Med J Aust 1974; 1: 355- 358.*

11. *Harris CS, Baker SP, Smith GA, et al. Childhood asphyxiation by food. JAMA 1984; 251: 2231 - 2235.*

12. *Zerella JT, Dimler M, McGill LC, et al. Foreign body aspiration in children: Value of radiography and complications of bronchoscopy. J Pediatr Surg 1998; 33: 1651 - 1654.*

13. *Wiseman NE. The diagnosis of foreign body aspiration in childhood. J Pediatr Surg 1984; 19: 531 - 535.*

14. *Moazam F, Talbert JL, Rodgers BM. Foreign bodies in the pediatric tracheobronchial tree. Clin Pediatr 1983; 22: 148 - 150.*

15. *Burton EM, Brick WG, Hall JD, et al. Tracheobronchial foreign body aspiration in children. South Med J 1996; 89: 195 - 198.*

16. *Swanson KL, Prakash UB, Midthun DE, et al. Flexible bronchoscopic management of airway foreign bodies in children. Chest 2002; 121: 1695 - 1700.*

17. *Wong KS, Lai SH, Lien R, et al. Retrieval of bronchial foreign body with central lumen using a flexible bronchoscope. Int J Pediatr Otorhinolaryngol 2002; 62: 253 - 256.*

18. *Monden Y, Morimoto T, Taniki T, et al. Flexible bronchoscopy for foreign body in airway. Tokushima J Exp Med 1989; 36: 35 - 39.*

19. *Wood RE, Gauderer MW. Flexible fiberoptic bronchoscopy in the management of tracheobronchial foreign bodies in children: the value of a combined approach with tube bronchoscopy. J Pediatr Surg 1984; 19: 693 - 698.*

20. *Godfrey S. Is there a place for rigid bronchoscopy in the management of pediatric lung disease? Pediatr Pulmonol 1987; 3: 179 - 184.*

21. *Puhakka H. Pediatric bronchoscopy- a report of methodology and results. Clin Pediatr 1989; 28: 253 - 257.*

22. *Wood RE. Pitfalls in the use of the flexible bronchoscope in pediatric patients. Chest 1990; 97: 199 - 203.*

23. *Nussbaum E. Pediatric fiberoptic bronchoscopy. Clin Pediatr 1995; 34: 430 - 435.*

*(Presented at the XIXth Annual Meeting of Turkish Association of Pediatric Surgeons with International Participation, 7-11 October 2001, Antalya, Turkey)

SSK Tepecik Hospital, Department of Pediatric Surgery, 35120, İzmir
Yazışma Adresi: Dr. Volkan Erikçi
Zafer Caddesi Turcanlar Apt. No: 17/6 35040 Bornova, İzmir
verikci@yahoo.com