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TRACHEOBRONCHIAL FOREIGN BODIES: A 10-YEAR EXPERIENCE[#]

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ABSTRACT

Background: *Our aim is to describe foreign body aspiration in the tracheobronchial tree, a common emergency with serious consequences.*

Methods: *We reviewed the records of 357 patients who were admitted to our hospital during a 10-year period for the treatment of aspirated foreign body into the tracheobronchial tree.*

Results: *Of these cases, 42.4% were male and 57.6% female. Their ages ranged from 4 months to 70 years (average of 10.8 years). The most common manifestation was coughing, with subsequent dyspnea and wheezing. All underwent rigid bronchoscopy for the removal of the foreign body. Foreign bodies were localized in the right bronchial tree in 188 cases (52.7%), the left in 107 cases (30%) and trachea in 39 cases (10.9%). Foreign bodies were not found during bronchoscopy in 23 cases (6.4%). The foreign bodies were: needles (n=125), peanuts (n=110), plastic objects (n=52), and miscellaneous (n=47). Foreign bodies were removed by bronchoscopy in all but six cases (1.7%), who underwent limited thoracotomy. The present series had a mortality of 0.56 percent (two deaths) following removal of foreign body.*

Conclusions: *Foreign body aspiration are rapidly recognized from the patient's history and easily treated by bronchoscopy and extraction of the aspirated foreign body. A high index of suspicion is crucial for early diagnosis. However, education is the best preventive measure for decreasing the incidence of this matter.*

Key words: *Tracheobronchial tree, foreign body, aspiration*

INTRODUCTION

Aspiration of foreign bodies is a very serious and vital problem, sometimes leading to sudden death and may cause chronic and irreversible lung injury. The Council of America cited the inhalation of foreign bodies, as a leading cause of accidental death at home, in children younger than six years of age.[1,2] Annual death rates from foreign body aspiration in the USA range from 500 to 2000.[3,4] In Turkey and especially in our region, the prevalence of foreign bodies aspiration is high.[5] The type of foreign body that is most frequently seen in this geographic area and the incidence of foreign body in relation to the habits of people have been studied.

MATERIAL AND METHODS

We reviewed hospital records and bronchoscopy protocols of 357 cases suffering from foreign body aspiration who were admitted to the Department of Thoracic Surgery of Atatürk University from 1990 to 2000. Prior to bronchoscopy, a complete medical history, physical examination and chest radiograph were obtained. General anesthesia, open rigid bronchoscope and various optical forceps were used in all patients. If endoscopic removal of the foreign body was necessary, it was performed under fluoroscopic control. The flexible fiberoptic endoscope was used only occasionally. After diagnostic bronchoscopy, the foreign body was removed by foreign body forceps or foreign body basket. Following the foreign body removal, secretions were suctioned, the bronchi were washed with saline and the bronchial three examined carefully. In cases where the procedure was prolonged, steroids were administered before removal of the bronchoscope. When the foreign body could not be removed by endoscopy, surgical treatment was performed.

RESULTS

Three hundred fifty seven cases underwent bronchoscopic treatment because of suspected foreign body aspiration. There were 151 (42.3%) male and 206 (57.7%) female. The patients ranged in age from 4 months to 70 years old (average 10.8) (Table 1). The mean age in the female was 12.9 years and peak incidence of foreign body aspiration occurred during the second decade of life, accounting for 32.6% of the total number.

The most common physical finding was

Table 1. Age distribution

Age	N	%
0-1	23	6.4
1-3	103	29.0
3-10	58	16.3
10-25	155	43.2
>25	18	5.1
Total	357	100

coughing (78.4%), followed by auscultatory wheezing (54.1%), decreased breathing sounds (41.2%), dyspnea (34.1%) and cyanosis (17.7%). Table 2 shows the frequency distribution of the symptoms and signs at presentation. Eighty two percent of the patients were symptomatic for less than 24 hours before admission and in 5% of cases, symptoms were present for more than one week. Duration of the symptoms ranged from one hour to two years, with a mean of two days. There was a history of aspiration in 337 patients (94.4%). The delay in diagnosis ranged from one hour to 16 months. The mean delay in the child group was significantly longer than in the adult group ($p<0.01$ by Student's T test).

Table 2. Symptoms and findings of foreign bodies

Symptoms	N	%
Coughing	280	78.4
Wheezing	193	54.1
Decreased breathing sounds	147	41.2
Dyspnea	120	34.1
Cyanosis	63	17.7
Fever	16	4.5

The radiopaque foreign body was confirmed by chest radiograph in 193 (54.1%) patients. The chest radiograph showed pneumonia in 42 patients (11.8%), atelectasis in 32 (9.0%), bronchiectatic changes in 16 (4.5%). In nine patients more than one change was found (2.5%). Ninety-six patients had a normal radiograph (26.9%). Nine patients underwent bronchoscopic removal of a foreign body without pre-bronchoscopic radiographs due to severe dyspnea.

The foreign bodies were located in the trachea in 39 (10.9%) patients, in the right bronchial three in 188 (52.7%), and in the left bronchial three in 107 (29.9%). 106 foreign bodies (29.7%) were in the right lower lobe bronchi. In 23 (6.4%) patients was not found foreign body. Needles were most commonly localized at the lower segment bronchus (Table 3). The most common foreign bodies were needles

Table 3. Localization of foreign bodies

Localization	N	%
Trachea	39	10.9
Right bronchus	188	52.7
Main	74	20.7
Lower	106	29.7
Middle	6	1.7
Left bronchus	107	29.9
Main	53	14.8
Lower	54	15.2

(35.0%), with turban pin alone accounted for 33.6% of the total (Table 4) (Picture 1), followed by

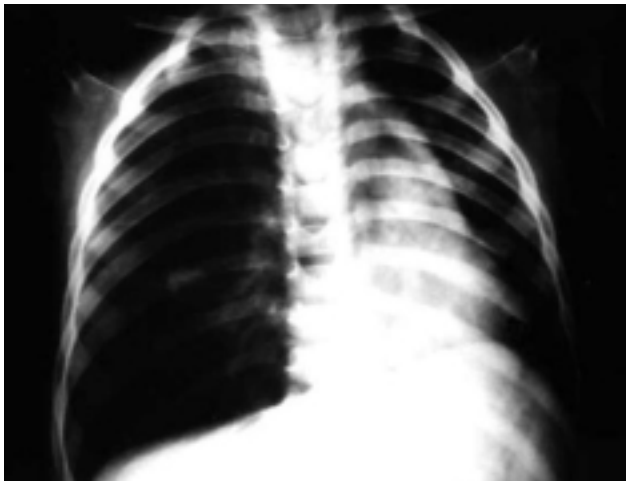
Table 4. Types of the foreign bodies

Type	N	%
Needle	125	35.0
Peanut	110	30.8
Plastic object	52	14.6
Miscellaneous	47	13.2
No foreign body	23	6.4

Picture 1. Posterior anterior radiograph of the chest shows turban pin in the superior segment of the right lower lobe.

peanuts, plastic object. Although peanuts and plastic objects were aspirated less often, these foreign bodies constituted the majority in children (Picture 2).

Extraction of the foreign body by bronchoscopy is the treatment of choice. Bronchoscopy was performed, even if the positive history is



Picture 2. The radiograph shows the trapping of air in the left lung field caused by a peanut in the left main stem bronchus.

accompanied only by mild symptoms or in cases without a history when clinical examination cannot exclude foreign body aspiration. In 357 patients the aspirated foreign body was removed under general anesthesia using appropriate size rigid bronchoscopes. In six patients with pins in subsegmental bronchi, the bronchoscopy was unsuccessful and minimal invasive thoracotomy was performed. The foreign body was removed by pneumotomy. Two patients had right lower lobectomy because of bronchiectasis. Tracheotomy was performed in two cases because of laryngeal edema. Prednisolone, 1 to 2 mg per kilogram was administered and nebulization was done immediately after the prolonged bronchoscopic procedure. Medical treatment was given to patients with negative bronchoscopic findings.

Three hundred fifteen patients (88.2%) had a one-day hospital stay, 11 (3.1%) stayed for two days and 31 (8.7%) stayed for over two days. The longest hospital stay was 22 days and mean hospital stay was two days. Cardiopulmonary arrest caused by hypoxia, occurred in 10 patients before bronchoscopic treatment eight of whom were successfully resuscitated and two of whom died.

DISCUSSION

The spectrum of airway foreign bodies varies from country to country, depending on the diet and customs of population.[5,6] Limper and Prakash[7], in their study of 60 consecutive adult patients with tracheobronchial foreign body aspiration, found that the most common type of foreign body was vegetable matter. Mu and colleagues reported that in China, nearly 95% of aspirated foreign bodies in children were organic.[8] In contrast, more industrialized countries have a greater incidence of plastic foreign body aspiration. This is due to the frequent use of small plastic parts in the toy industry.[9-11] The nature of aspirated foreign bodies reported in various studies differs according to lifestyle and eating habits. Nuts in general and peanuts in particular remain the most commonly found aspirated foreign bodies in children.[1,6,9,12] Although bone aspiration is prevalent in previous studies of adults, such cases were relatively rare in our series.[7,13]

In Turkey the prevalence of the foreign body aspiration is high. The high prevalence is due to possible lack of parental attention and dietary habits. Because of habits peculiar to Muslims in our geographic area, as in many other parts of Turkey, aspiration of the – turban pin- is common, although rare in the other parts of the World. Straight pins are used extensively for securing facial scarves in women and girl in many Islamic countries.

Although foreign body aspiration can be seen in all ages, it is most common under the age of three.[9-11] Darrow and Holinger reviewed multiple case series and found that children younger than five 5 years of age account for approximately 84% of cases and children younger than three years of age account for 73%.[14] Our series, however, contrast with other reports, and foreign body aspiration was observed most commonly between the ages of 10 and 20 years. The mean age was calculated as 10.8. We attributed this result to the widespread habit of wearing a scarf and fastening it with pins due to their belief and tradition in that part of Turkey, because we detected turban pin aspiration in one third of the cases and all of them were female in our study. We found that foreign body aspiration was more common in adults than in children.

In contrast to the adult group, the majority of the foreign bodies in the child group were lodged in the proximal airways, probably because of the smaller bronchial tree diameter and peanuts being the most common foreign bodies in this group. However, 56% of the foreign bodies in the adult group were localized in the more distal and subsegmental bronchi. Needles can go forward to the distal bronchus and sometimes-bronchoscopic extraction may be impossible.

Posterior-anterior and lateral chest radiography is standard when foreign body aspiration is suspected, but chest-X-ray films do not always contribute to the diagnosis. Radiopaque bodies

can be detected in plain chest films. Radiolucent bodies can be diagnosed from the secondary pathological changes apparent in the chest films, such as infiltration, unilateral hyperaeration, atelectasis and bronchiectasis. Vane and colleagues reported that more than 90% of foreign bodies were radiolucent.[15] We detected radiopaque foreign bodies in most of our cases and radiographic findings were positive in two third of the cases. Secondary pathological changes were significantly more common in children whereas radiopaque bodies were significantly more common in adults (significant difference between the groups by X^2 test [$p<0.01$ for both radiograph findings]).

Bronchoscopic removal of the foreign bodies is the treatment of choice, although some advise postural drainage for therapeutic purposes.[9] Rigid bronchoscopes are the instruments of choice for foreign body extraction, especially within the pediatric airway. When the foreign body is visualized, forceps are used to gently grasp the object for retrieval. Excessive pressure or biting motions may lead to fragmentation of the foreign body. If object is sharp, it is removed most safely when it is sheathed within the lumen of the scope, decreasing the risk of mucosal injury. The flexible bronchoscope may be of some help in a patient with a foreign body lodged far in the lung periphery. The flexible fiberoptic endoscope was used occasionally in our clinic.

Foreign bodies, which cannot be grasped by endoscopic forceps, can be removed by thoracotomy and pneumotomy. Thoracotomy was obligated in six of the needle aspiration cases because the foreign body could not be taken out by bronchoscope. Two patients had right lower lobectomy because of bronchiectasis. Cardiopulmonary arrest was developed in ten of our cases and two of them died.

When bronchoscopic manipulations lasted longer than 15 minutes, steroid was utilized after bronchoscopy, because we believe that these medications decrease the incidence of postbronchoscopic tracheotomy. The low incidence of tracheotomy in our series supports this view.

Finally, the very high incidence of foreign body aspiration in this region warrants an aggressive health education campaign to educate the community about the causes and dangers of this serious problem. The use of adhesive bands or snap fasteners, instead of pins, when wearing a turban, could minimize aspiration hazard.

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