

Use of Fiberoptic Bronchoscopy in Endobronchial Foreign Body Removal in Adults

Taha Bahadır Üskül, Hatice Türker, Sinan Arslan, Ahmet Selvi, Aydın Kant

Süreyyapaşa Training and Research Hospital for Chest Diseases and Thoracic Surgery, 1st Chest Diseases Department, İstanbul, Turkey

Abstract

Introduction: Our aim was to investigate the success rate of fiberoptic bronchoscopy (FB) in endobronchial foreign body removal, and to determine the clinical, radiological, and endoscopic features of non-asphyxiating foreign body aspiration in adolescents and adults. **Patients and methods:** Seven of 1799 (0.4%) bronchoscopies were performed to remove foreign bodies between October 2003 and September 2006. FB was performed with patients in the supine position using an oral approach. Alligator jaw forceps or three-prong flexible grasping hooks were used to remove the foreign body. All bronchoscopies were performed by the same bronchoscopist. The process was not repeated when the foreign body could not be removed. In these cases, the foreign body was removed by rigid bronchoscopy under general anesthesia. All complications were recorded. **Results:** Two of seven (29%) patients were male, and five (71%) were female. The most frequent symptom was cough (86%). Five (72%) patients had aspirated a headscarf pin; one (14%), a rubber with a metallic tip; and another (14%), a lemon seed. Foreign bodies were found in the right bronchial system in three (43%) patients, the left bronchial system in another three (43%), and the trachea in one (14%) patient. Foreign bodies were removed successfully in six (86%) of seven patients. No complications occurred. **Conclusions:** Removing non-asphyxiating foreign bodies in adolescents and adults with FB is a safe and successful method when performed by an experienced bronchoscopist, well educated staff, and at a well equipped bronchoscopy unit.

Keywords: Fiberoptic bronchoscopy, foreign bodies, adults

Received: Feb 02, 2007

Accepted: Jul 06, 2007

INTRODUCTION

Foreign body aspiration occurs rarely in adults compared to children [1]. It can result in asphyxia and death in children under 4 years old and sometimes causes chronic pulmonary problems. These patients are commonly misdiagnosed with pneumonia or asthma [2–4]. In adults, foreign body aspiration does not cause asphyxia, although accompanying comorbid diseases may occur in the older population. In adults with corrupted oropharyngeal reflexes, neurological and psychiatric disorders, and those using oral prostheses and sedatives, an increased risk of foreign body aspiration exists [5, 6].

Traditionally, rigid bronchoscopy is preferred for foreign body removal in adults. However, it has recently been reported that fiberoptic bronchoscopy (FB) is also effective and reliable [7–9].

In the present study, we investigated the success rate of FB for endobronchial foreign body removal, and determined the clinical, radiological, and endoscopic features of non-asphyxiating foreign body aspiration in adolescents and adults.

MATERIALS AND METHODS

Seven of 1799 (0.4%) bronchoscopies were performed to remove foreign bodies between October 2003 and September 2006 in our clinic. The patients were investigated according to age, sex, history of aspiration, time interval between aspiration and hospital admission, symptoms, clinical findings, radiological findings, type of foreign body removed, and foreign body location in the trachea or bronchial tree.

FB was performed after taking posteroanterior (PA) and lateral chest radiographs. Before FB, premedication with diazepam and atropine was administered to all patients. Topical anesthesia was provided by applying a 10% lidocaine aerosol solution to the posterior oropharynx, and the cough reflex was suppressed by applying a 2% lidocaine solution to the vocal cords and bronchi during bronchoscopy. FB (Olympus BF type 1T30 video bronchoscope) was performed with patients in the supine position using an oral approach. After foreign body fixation, photographs were taken. Alligator jaw forceps or three-prong flexible grasping hooks were used to remove the foreign body. Once the foreign body was snared, all three (bronchoscope, grasping instrument, and foreign body) were removed simultaneously from the patient. All bronchoscopies were performed by the same bronchoscopist. The process was not repeated when the foreign body could not be removed. In these cases, the foreign body was removed by rigid bronchoscopy under general anesthesia.

Antibiotics were given to the patients for a week after bronchoscopy if necessary by a clinician. All complications were recorded.

Corresponding Author: Taha Bahadır Üskül, Süreyyapaşa Training and Research Hospital for Chest Diseases and Thoracic Surgery, 1st Chest Diseases Department, İstanbul, Turkey, Phone: +90 216 4412350, e-mail: tbuskul@yahoo.com

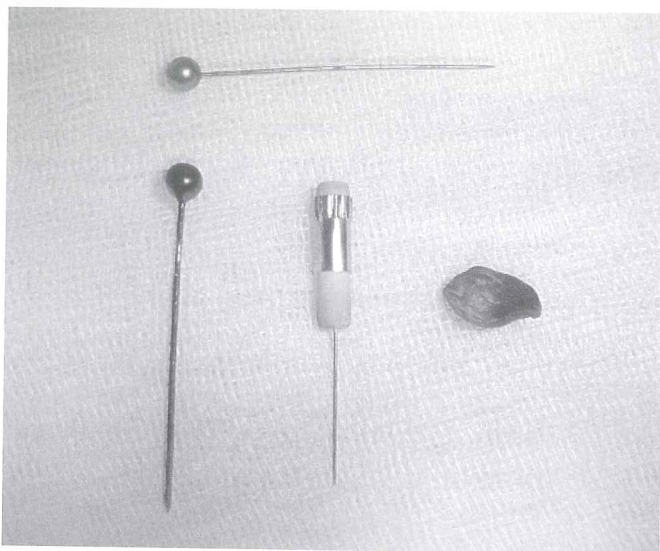


Figure 1. Foreign bodies removed with FB

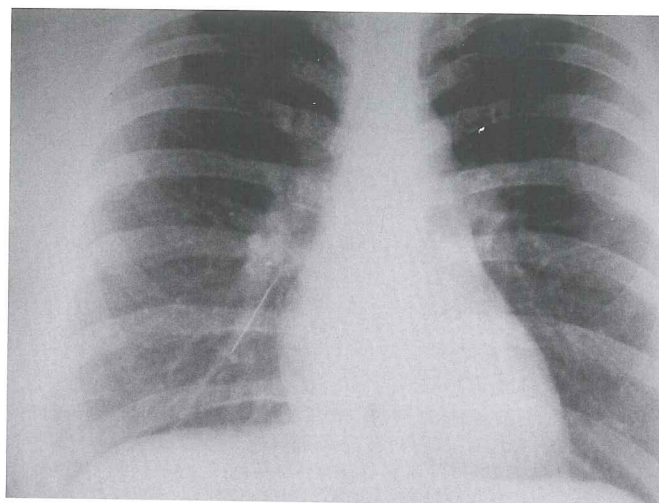


Figure 2. PA chest radiography of patient 3

RESULTS

The mean age of the patients was 33 ± 18 years (range 15–60). Two of seven (29%) patients were male, and five (71%) were female. The time interval between aspiration and admission to our center was less than 24 h for four (57%) patients (Table 1).

The most common symptom was cough (Table 2), and the most common physical finding was decreased pulmonary sounds. Wheezing, crackles, and localized rhonchi were other findings (Table 3).

None of the chest X-rays was normal. In six patients (86%), the foreign body was radiopaque. In our other patient, the radiological finding was pulmonary infiltration. The foreign bodies were seen in the right bronchial system in three (43%) patients, the left bronchial system in another three (43%), and in the trachea in one (14%) patient (Table 4).

At the time of admission, five (71%) of our patients had a history of foreign body aspiration. In patient 7 who

had no history of aspiration, FB was performed because of recurrent pneumonia and hemoptysis. Bronchoscopy revealed a foreign body (lemon seed) obstructing the right lower lobe basal segment entrance. It was removed with a three-prong flexible grasping hook, and secretion was removed by lavage. Antibiotic therapy was given to this patient who had pneumonia and hemoptysis. In patient 4, who suffered dyspnea and chest pain for 4 days, had no history of aspiration. PA chest radiography revealed a radiopaque headscarf pin, which was removed with alligator jaw forceps under FB.

Foreign bodies were removed successfully from six (86%) of seven patients (Fig. 1). In patient 3 who aspirated a headscarf pin 4 days previously, FB revealed the pin in the distal region of right lower lobe (Figs. 2 and 3). Granulation tissue was seen near the foreign body. The sharp tip of the needle could not be removed from the bronchial mucosa with alligator jaw forceps. Therefore, the foreign body in this case was removed by rigid bronchoscopy with fluoroscopy guidance under general anesthesia.

The extracted foreign bodies were five (72%) aspirated headscarf pins, one (14%) rubber object with a metallic tip, and one (14%) lemon seed. No complications occurred during foreign body removal with FB.

Table 1. Patient characteristics

Patient no.	Age (years)	Sex	History of aspiration	Time elapsed between aspiration and FB
1	15	M	+	<24 h
2	55	F	+	<24 h
3	37	F	+	4 days
4	22	F	-	4 days
5	22	F	+	<24 h
6	18	F	+	<24 h
7	60	M	-	Unknown

Table 2. Symptoms

	Number of patients (%)
Cough	6 (86)
Hemoptysis	2 (29)
Dyspnea	1 (14)
Chest pain	1 (14)

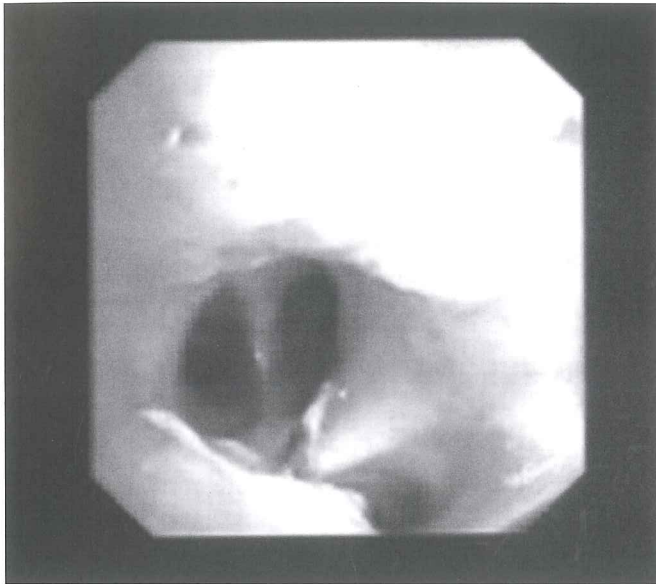


Figure 3. Bronchoscopic view of patient 3

DISCUSSION

The death rate from asphyxia due to foreign body aspiration is 1.3 in 100,000. Death from foreign body aspiration has a bimodal pattern, with peaks at ages under 1 year (1.9 per 100,000) and over 75 years (10.7 per 100,000) [10]. Foreign body aspiration occurs commonly in childhood and to a lesser extent in adults. In adults, it happens more frequently in older people due to insufficient airway protective mechanisms [6]. The acute complications of non-asphyxiating foreign body aspiration are pneumothorax, pneumomediastinum, and obstructive emphysema, and in delayed cases may cause recurrent pneumonia and hemoptysis, bronchiectasis, infection, and abscess. A delay in diagnosis of over 24 h increases the incidence of complications [10]. In our patient 7, recurrent hemoptysis and pneumonia occurred due to aspiration. A lemon seed was removed by FB. This patient had complained of hemoptysis and was hospitalized two times in 1 year due to pneumonia. Therefore, foreign bodies should be diagnosed and removed as early as possible. In unsuccessful bronchoscopy, bronchotomy or lobectomy may be required in delayed cases [11].

In adults, the right lower lobe bronchus is more frequently affected because it is wider than the left bronchus

and makes a wider angle with the trachea. It has been reported that 40–70% of foreign body aspirations occur in the right bronchial system, 30–40% in the left bronchial system, and 10–20% in the laryngotracheal region [10]. In our patients, the right and left bronchial systems were affected equally, and in one patient, the foreign body was in the trachea.

Age, sex, socioeconomic status, and nutritional habits play important roles in foreign body aspiration. Although nutrient aspiration occurs more often in Western countries [12], fish and chicken bone pieces are commonly aspirated in Asian populations [1]. It has been reported that pin aspiration is often encountered in Turkey [13–15] because turbans are fixed with pins, and indeed headscarf pin aspiration was detected in 72% of our patients.

Rigid bronchoscopy is generally performed to remove aspirated foreign bodies, but FB is also used in adults. It has been reported that the success rate of rigid bronchoscopy is 98%, while that of FB is only 60–75% [6]. Cunanan *et al.* reported that they used FB instead of rigid bronchoscopy in a case series of 300 patients and lowered the mortality rate from 12 to 1% [16]. In another case series of 62 patients, only four required rigid bronchoscopy [17]. Chen *et al.* reported a success rate of 74% for FB [1], while Karadağ *et al.* removed foreign bodies successfully in six of seven cases, and reported a success rate of 86% [13]. Our success rate was also 86%, consistent with that reported in the literature, and no complications occurred.

Granulation tissue developed after aspiration had complicated foreign body removal with FB, but no correlation was detected between the time elapsed following aspiration and the amount of granulation tissue. The granulation tissue that develops after aspiration does not bleed easily upon biopsy, differing from that in cancer. Therefore, it has been reported that bleeding is not a major problem during foreign body or granulation tissue removal with forceps [9]. In our patient who aspirated a headscarf pin 4 days previously, FB revealed that granulation tissue developed in the right lower lobe distal region in the vicinity of the trapped pin. Due to the presence of the granulation tissue, the tip of the pin could not be removed, and the foreign body was extracted by rigid bronchoscopy under general anesthesia.

Table 3. Physical findings

	Number of patients (%)
Decreased pulmonary sounds	4 (58)
Wheezing	1 (14)
Crackles	1 (14)
Localized rhonchi	1 (14)

Table 4. Localization of foreign bodies

	Number of patients (%)
Trachea	1 (14)
Right lower lobe bronchus	3 (43)
Left main bronchus	1 (14)
Left lower lobe bronchus	2 (29)

The advantages of rigid bronchoscopy are a wide area of operation, efficient airway control during the process, and optimal ventilation for the patient, which lead to quick and reliable foreign body removal. However, disadvantages include the need for general anesthesia and its expense, and additional morbidity risk in older patients. Recently, FB has become the preferred mode of foreign body removal in adults because it does not require general anesthesia and has better screening of distal airways and upper lobes. Moreover, it is more applicable in patients with face, neck, and head wounds and in intubated patients in intensive care units [18].

When foreign bodies are extracted by FB, the possibility exists of losing the foreign body in the narrow subglottic area, which can lead to asphyxiation. In the rare event of this occurring, immediate intubation, either with bronchoscopic guidance or a laryngoscope, can always be performed to secure the airway. Various sizes of endotracheal tube (ETT), as well as a laryngoscope, must be available in bronchoscopy suites. Extraction can then proceed via ETT. Another approach is to reintroduce FB to push the foreign body into the distal airway, thus clearing the upper airway obstruction [10].

In difficult cases, when conscious sedation cannot be achieved adequately, rigid bronchoscopy under general anesthesia is the best option. In these instances when the foreign body is too distal and inaccessible for removal by rigid bronchoscopy, the foreign body can be removed with a flexible bronchoscope via an ETT or rigid bronchoscopy [19]. The foreign body was not removed with a flexible bronchoscope via an ETT or rigid bronchoscopy in any of our patients.

Limitations caused by a narrow-diameter FB channel have been overcome by using various grasping forceps, wire baskets, balloon catheters, and magnetic extractors [10]. Rafanan and Mehta reported that FB is the gold standard in tracheobronchial foreign body diagnosis, and is the preferred instrument for their removal in adults [7]. FB has also recently replaced rigid bronchoscopy in children [20, 21].

The key to removing foreign bodies lies in being able to secure the object adequately by grasping or enclosing it with forceps or a basket. Once the foreign body is snared, all three (bronchoscope, grasping instrument, and foreign body) are removed simultaneously. During the removal, the bronchoscopist must make every attempt to continuously observe the foreign body, always keeping it in the center of the airway. Postbronchoscopic complications occur in 5% of cases, and are usually secondary to a foreign body inflammatory reaction. These reactions include atelectasis,

pneumonia, retained fragments, vocal cord swelling, bronchospasm or laryngospasm, pneumomediastinum, bleeding from foreign-body-induced perforation, and death [22].

More recently, FB has become the preferred method of foreign body removal because new specialists in pulmonary diseases do not have sufficient experience in rigid bronchoscopy, and FB is an easier and more common technique to use [6]. However, removal of a foreign body is probably the most challenging flexible bronchoscopic procedure. Complications with foreign body removal have been shown to be more frequent in the hands of less-experienced physicians. In the same way, the success rate of foreign body removal using the flexible bronchoscope will largely depend on the experience and skill of the operator, rather than the instrument per se [13]. In our clinic, FB has been the first choice in adolescent and adult patients admitted with foreign body aspiration since 2003. Rigid bronchoscopy is used as a second choice in patients who cannot tolerate FB, or who have foreign bodies that cannot be removed by FB.

In conclusion, diagnosing and removing non-asphyxiating foreign bodies, especially in distal airways, in adolescents and adults with FB is a safe and successful method in the hands of an experienced bronchoscopist, well educated staff, and a well equipped bronchoscopy unit.

REFERENCES

1. Chen CH, Lai CL, Tsai TT et al. Foreign body aspiration into the lower airway in Chinese adults. *Chest* 1997;112:129-33.
2. Pasaoglu I, Dogan R, Demircin M et al. Bronchoscopic removal of foreign bodies in children: retrospective analysis of 822 cases. *Thorac Cardiovasc Surg* 1991;39: 95-98.
3. Gürpınar A, Kılıç N, Doğruyol H. Foreign body aspiration in children. *Turkish Resp J* 2003;4:131-4.
4. Kula O, Gürkan S, Altınöz H et al. Foreign body aspiration in infants and children. *Turkish Resp J* 2003;4:76-8.
5. Tariq SM, George J, Srinivasan S. Inhaled foreign bodies in adolescents and adults. *Monaldi Arch Chest Dis* 2005;63:193-8.
6. Limper AH, Prakash UB. Tracheobronchial foreign bodies in adults. *Ann Intern Med* 1990;15:604-9.
7. Rafanan AL, Mehta AC. Adult airway foreign body removal. What's new? *Clin Chest Med* 2001;22:319-30.
8. Donado Una JR, de Miguel Poch E, Casado Lopez ME, et al. Fiberoptic optic bronchoscopy in extraction of tracheo-bronchial foreign bodies in adults. *Arch Bronconeumol* 1998;34(2): 76-81.
9. Lan RS, Lee CH, Chiang YC et al. Use of fiberoptic bronchoscopy to retrieve bronchial foreign bodies in adults. *Am Rev Respir Dis* 1989;140:1734-7.
10. Rafanan AL, Mehta AC. Bronchoscopy in foreign body removal. In: Wang K, Mehta AC, Turner JF (eds). *Flexible Bronchoscopy*, 2nd ed. Malden, MA: Blackwell Publishing, 2004: 197-208.
11. Carter R. Bronchotomy: the safe solution for an impacted foreign body. *Ann Thorac Surg* 1970;10:93-4.

12. Baharloo F, Veyckemans F, Francis C et al. Tracheobronchial foreign bodies: presentation and management in children and adults. *Chest* 1999;115:1357-62.
13. Karadağ M, Ediger D, Akar B et al. Cases of tracheobronchial foreign bodies aspiration. *Arch Lung* 2002;3:111-4.
14. Öztuna F, Ayçiçek O, Bülbül Y et al. Our cases with endobronchial foreign body. *Arch Lung* 2006;7:22-4.
15. Hasdiraz L, Bicer C, Bilgin M et al. Turban pin aspiration: non-asphyxiating tracheobronchial foreign body in young Islamic women. *Thorac Cardiovasc Surg* 2006;54:273-5.
16. Cunanan OS. The flexible fiberoptic bronchoscope in foreign body removal: experience in 300 cases. *Chest* 1978;73(Suppl 5):725-6.
17. Debeljak A, Sorli J, Music E et al. Bronchoscopic removal of foreign bodies in adults: experience with 62 patients from 1974-1998. *Eur Respir J* 1999;14:792-5.
18. Dikensoy O, Usalan C, Filiz A. Foreign body aspiration: clinical utility of flexible bronchoscopy. *Postgrad Med J* 2002;78:399-403.
19. Soysal O, Kuzucu A, Ulutas H. Tracheobronchial foreign body aspiration: a continuing challenge. *Otolaryngol Head Neck Surg* 2006;135: 223-6.
20. Swanson KL, Prakash UB, Midthun DE et al. Flexible bronchoscopic management of airway foreign bodies in children. *Chest* 2002;121:1695-1700.
21. Ramirez-Figueroa JL, Gochicoa-Rangel LG, Ramirez-San Juan DH et al. Foreign body removal by flexible fiberoptic bronchoscopy in infants and children. *Pediatr Pulmonol* 2005;40:392-7.
22. Uzaslan E, Ursavaş A, Ediger D et al. An unusual way of tracheal stoma cleaning could end up with foreign body aspiration in a laryngectomized patient. *Tuberk Toraks* 2005;53:62-5.