

Institutional report - Thoracic non-oncologic Extraction of airway foreign bodies in adults: experience from 1987–2008[☆]

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Received 16 March 2009; received in revised form 6 May 2009; accepted 6 May 2009

Abstract

To determine the incidence and the clinical, radiographic, and endoscopic characteristics of adult patients in our area diagnosed with tracheobronchial foreign bodies (FBs), we have performed a descriptive retrospective study analysing rigid and flexible bronchoscopies practised at our department between 1987 and 2008 in patients older than 14 years. Of the 9781 bronchoscopies performed, 32 involved cases of bronchoaspiration of FBs. The mean age of the patients was 43.81 years (S.D. 21.43); 65.6% were male and 34.4% were female. Acute or recurrent infection was the most frequent clinical presentation. Chest radiographs provided data for diagnosis in 68% of the cases. The most common FB aspirated were inorganic (pins and plastic devices 21.4%, respectively). In conclusion, we can state that in our area tracheobronchial aspiration of FBs by adults is not common. The clinical symptoms are highly variable and the FBs are usually lodged in the right bronchial tree.

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Keywords: Bronchoaspiration; Foreign body; Fibrobronchoscopy; Rigid bronchoscopy

1. Introduction

Aspiration of foreign bodies (FBs) occurs frequently in children; 75% of cases occur in children younger than 3 years of age [1]. However, FB aspiration does occur in adults and elderly people as well [2], although the incidence is not known. One of the largest series published identified 65 adults with tracheobronchial FB aspiration over a period of 12 years [3].

Symptoms in adults depend on the site of the FB impaction. The classical triad of cough, dyspnea, and cyanosis occurs in only a small percentage of patients [4]. A non-asphyxiating FB may be asymptomatic. Many of these objects are wedged distally and patients often do not remember choking, the aspiration, or any precipitating event [5]. Thus, FB aspiration is commonly misdiagnosed. Diagnosis can be delayed for months to years from the initial event [5, 6] and often results from fortuitous discovery when fibrobronchoscopy is performed to evaluate a chronic cough, hemoptysis, or a slow resolution of pneumonia [7].

The use of bronchoscopy for FB removal was introduced by Gustav Killian in 1897 [8]. Currently, both rigid and flexible bronchoscopes are utilised for this indication,

depending on the age of the patient and the characteristics of the FB [9]. Because of improvement in the accessories used to remove FBs, survival is good and morbidity is low following bronchoscopic FB removal [10].

The aim of our study was to report our experience over a period of 21 years concerning the clinical, radiological, and endoscopic characteristics of adult patients with FB bronchoaspiration.

2. Patients and methods

We conducted a descriptive retrospective study that included 32 patients older than 14 years of age with bronchoaspiration of FBs diagnosed between 1997 and 2008. We did not include cases of broncholithiasis or aspiration of gastric contents.

The variables assessed in this study were sex, age, symptoms, bronchoaspiration history, risk factors, radiologic findings, localisation, time passed until the extraction, and complications related to the FB or derived at the time of removal. Bronchoscopy was performed with conscious sedation and topical anaesthesia. Rigid bronchoscopies were performed in the operating room under general anaesthesia.

2.1. Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences version 9.0 for Windows (SPSS,

[☆]This work was supported by grants from Intesification of research of 'Fondo de Investigaciones Sanitarias (FIS)'.

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Chicago IL, USA). Age is reported as mean and standard deviation (S.D.). All other categorical variables were summarised as counts and percentages. We compared proportions using χ^2 -test or Fisher exact tests. Student's *t*-test was used to compare quantitative variables. Results were considered statistically significant when *P* was <0.05.

3. Results

Of the 9781 bronchoscopies performed from 1997 to 2008, 32 were due to bronchoaspiration of a FB (0.32%). Twenty-one patients were male (65.6%) and 11 were female (34.4%). Their mean age was 43.81 years (S.D. 21.43). Forty-four percent of the patients showed at least one risk factor. The most common risk factors were tracheostomy cannula handling (6 patients, 18.8%), cranioencephalic traumatism (2 patients, 6.3%), and intravenous (IV) drug addiction (2 patients, 6.3%). Alcoholism, dental manipulation, and fibrobronchoscopy performance were each present in 3% of cases.

Inorganic objects were the most common FBs aspirated (*n*=23, 78%). Of the inorganic objects, the most common were pins and plastic devices (3 patients each, 21.4%) followed by tablets, dental pieces, and fragments of dental prosthesis (2 patients each, 14%; Fig. 1a, b, g). Organic FBs were present in nine patients (28%), the most common were bone fragments and vegetables (3 cases each, 33.3%; Fig. 1c).

According to the risk factors present and the nature of the FB, we could differentiate four groups (Table 1):

1. FB of iatrogenic origin (*n*=7) where the risk factors were 5 tracheostomies, 1 fibrobronchoscopy, and 1 dental manipulation. Four FBs were objects used to clean tracheostomies (3 brushes and 1 hair clip with tissue paper; Fig. 1d), one was a voice prosthesis, one was a tracheostomy stopper, and one was a silicone dental mold.
2. Organic FBs (*n*=8). Three were bone fragments, 2 were fishbones and 3 were vegetables (Fig. 1f). One patient was an alcoholic.
3. FBs related to cranioencephalic traumatism (*n*=2), both with bronchoaspiration of dental pieces (Fig. 1b).
4. Inorganic FBs (*n*=15): 3 pins and 1 hypodermic needle (2 in IV drug addicts), 1 screw, 1 dental bridge, 1 rivet from blue jeans, 2 tablets, 2 dental fragments, and 4 plastic objects (Fig. 1a, g). The mean age of the patients from groups 1 and 2 was 60.3 years (S.D. 9.97), while that of groups 3 and 4 was 28.32 years (S.D. 17.21; *P*=0.075).

In 17 cases, the patients went to the emergency room immediately after bronchoaspirating the FB (13 patients within the first 24 h). Eight patients did not notice the episode and 7 remembered only upon clinical suspicion or at the endoscopic finding. The longest time between bronchoaspiration and FB removal was 1 year; this occurred in two cases. In one of these cases, the patient bronchospirated some of the paste used to make a dental mold; the other patient bronchoaspirated part of a tooth while sleeping (Fig. 1e). Acute infection (8 patients, 25%), cough (7 patients, 22%), and choking (6 cases, 19%) were the most

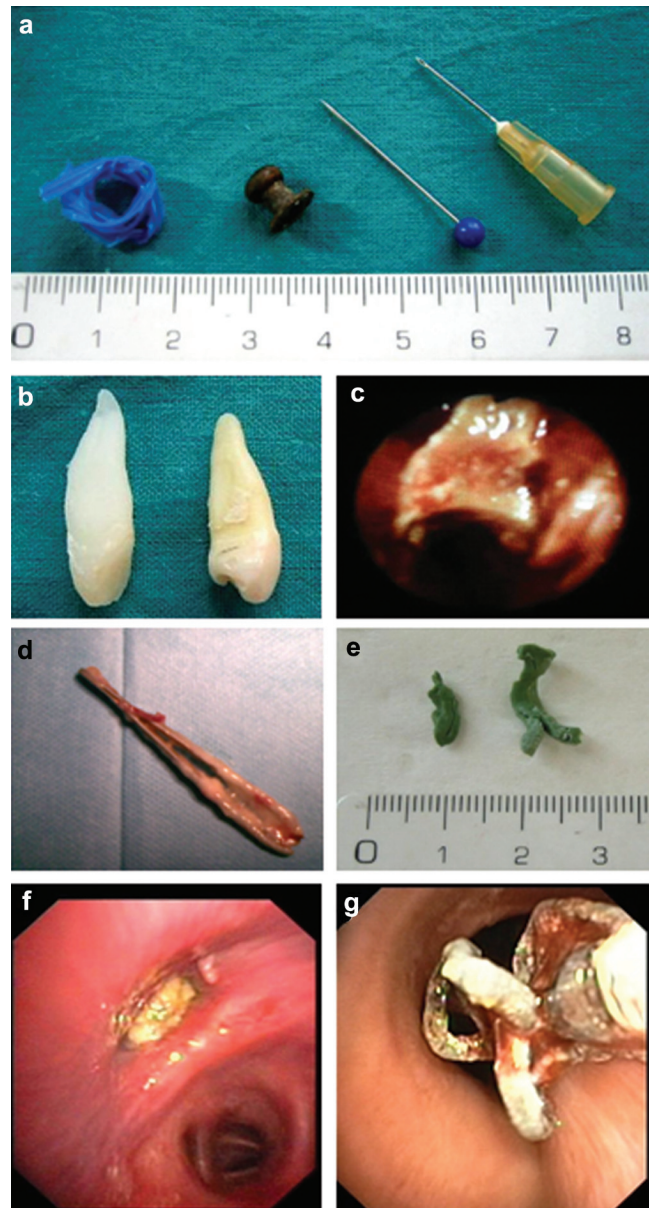


Fig. 1. (a) Different foreign bodies removed by fibrobronchoscopy. (b) Two dental pieces removed from a patient with cranioencephalic traumatism. (c) Endoscopic image of a bone fragment lodged in the bronchus intermedius. Granulation tissue and mucosal inflammation are evident. (d) Hair clip removed from a patient with tracheostomy. (e) Bronchial mold made from synthetic material used to make a dental prosthesis. (f) Endoscopic image of a fishbone in the right middle lobe bronchus. (g) Endoscopic image taking during the removal of a plastic foreign body.

frequent symptoms. Thirteen patients (40.6%) showed an acute or chronic infectious process. Three patients did not show symptoms of any kind.

With regard to radiological findings, in 15 cases (47%) the FB could be detected by chest radiography (Fig. 2a, b, c, d) while in 17 cases (53%) the FB was not evidenced. Normal radiographs were observed in 9 patients (28%). Evidence of parenchymal infection was present in 13 patients [alveolar infiltrate (11 patients, 34%) and bronchiectasis (2 patients, 6%)]. In 10 cases (31%), we could only observe the FB in the chest radiograph. FBs were more

Table 1
Relationship between risk factors and type foreign body aspirated

Group	n	Risk factors	Foreign bodies
Iatrogenics	7	5 Tracheostomies 1 Fibrobronchoscopy 1 Dental manipulation	3 Brushes 1 Voice prosthesis 1 Stoper tracheostomy 1 Silicone dental mold 1 Hair clip
Organics	8	1 Alcoholism	3 Bone fragments 2 Fishbones 3 Vegetables
Postratmatism	2	2 Cranioencephalic traumatism	2 Teeth
Inorganics	15	2 IV drug addiction	3 Pins 1 Hypodermic needle 1 Screw 1 Dental bridge 1 Rivet 4 Plastic devices 2 Tablets 2 Dental fragments

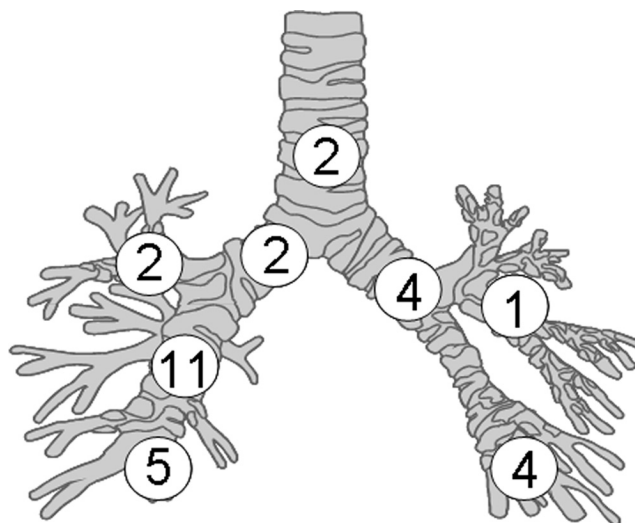


Fig. 3. Endoscopic localization of the foreign bodies.

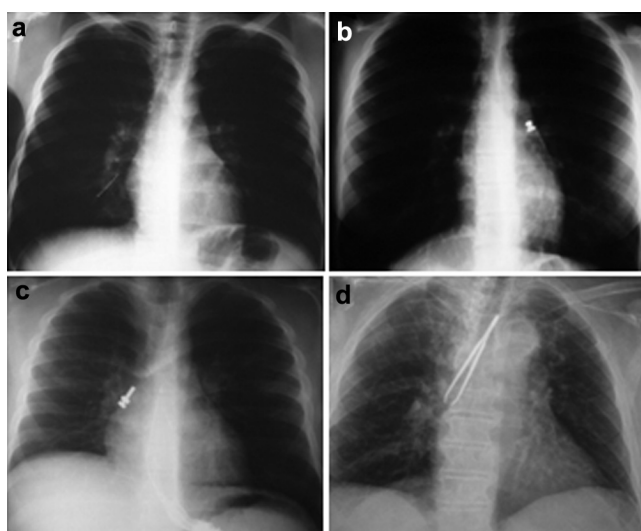


Fig. 2. Posteroanterior chest radiographs showing different radiopaque foreign bodies. (a) Pin lodged in the medial basal segmental bronchus. (b) Rivet in the left main bronchus. (c) Screw lodged in the bronchus intermedius. (d) Hair clip lodged in the trachea.

frequently located in the right versus the left bronchial tree (69% vs. 25%) and only two FBs were in the trachea (Fig. 3).

Bronchoscopy was performed to remove the FB in 24 cases (75%). Rigid bronchoscopy was used in four cases (12.5%), flexible bronchoscopy was performed in 18 patients (56.4%), and both techniques were used in two cases (6.3%). Thoracotomy was necessary in five patients (15.6%); four of these patients had residual lesions following inflammatory processes. Two patients spontaneously expelled the FB during the fibrobronchoscopy (6.3%). After FB removal, the most frequent endobronchial lesions were granulation tissue and mucosal inflammation (13 patients, 40.6%). In 19 cases (59.4%), the mucous was normal or slightly swollen.

4. Discussion

Bronchoaspiration of a FB is not common in adults. The frequency observed in our study coincides with that published in other studies [6, 9]. Nevertheless, we observed a frequency somewhat higher than that published by Marquette et al. in 2000 [7]. This could be because we are a Thoracic Surgery reference centre for six hospitals. The mean age of our patients (43.81 years) does not coincide with that published by other authors [3, 11]. In our series, we observed a bimodal distribution: a group of young patients (second or third decade of life) in which bronchoaspiration of inorganic FBs or dental pieces was common and a group of older patients (sixth or seventh decade of life) who bronchoaspired a FB of alimentary or iatrogenic nature.

Risk factors for the bronchoaspiration of a FB in adults are older age, abuse of sedative medications, neurological disorders (vascular dementia, Parkinson's), mental retardation, trauma with loss of consciousness, dental care, alcoholism, and medical procedures, such as those resulting from cleaning or manipulating tracheostomy cannulas [12]. In our study, risk factors were present in 44% of the patients. In the literature this percentage is highly variable, ranging from 9 to 27% in some reports [12] and up to 41% in others [13]. We must emphasise that in our series, the mean age of the patients with any risk factor was older than that for patients without risk factors, with many of the younger patients accidentally aspirating small plastic or metal objects that had been introduced into the mouth as entertainment.

Bronchoaspiration of a FB can manifest with various symptoms. The most frequent, especially in children, is choking with cough, dyspnea, and cyanosis at the time of bronchoaspiration. Often, adults do not spontaneously report the episode of choking and the finding of the FB may be fortuitous when bronchoscopy is performed because of a chronic cough, hemoptysis, or repeated or prolonged pneumonia. In our study, the clinical presentation was highly variable; infection was most common (40.6%), as has been reported in other series [9, 12].

In other series, posteroanterior or lateral chest radiographs were pathologic in 70–90% of patients with FB aspiration [6, 9, 12]. Metallic FBs are easily identified in their tracheobronchial anatomic location with great accuracy, but their frequency is low, around 10%. When the FB is not radiopaque, it is not detected in the radiograph, but may be suspected due to the presence of atelectasis, pneumonitis, air trapping, or mediastinal displacement in the exhaled chest radiograph [14]. In our experience, chest radiography was useful in 68% of cases. The FB was observed on X-ray in 15 cases, and the FB was metallic in all of these. However, like other authors, we found no evidence of obstructive emphysema [12].

In all series, the FBs tended to localise in the right bronchial tree [3, 9, 12]. In our series, 68% of the FBs were localised on the right side, most frequently in the bronchus intermedius (11 patients) This right-side predominance can be explained by the vertical nature of the right main bronchus, its larger diameter, the greater air flow through it, and the localisation of the carina to the left of the midline of the trachea [13, 15].

In our series, we could remove the FB by bronchoscopy (both types) in 75% of the cases. Nevertheless, we observed a high incidence of surgical treatments relative to other studies [6, 9, 13]. This fact could be explained for the parenchymal sequelae following recurrent infections due to delayed diagnosis in some cases, the special nature of some FBs and by the fact that our hospital is a Thoracic Surgery reference centre for six hospitals.

In conclusion, bronchoaspiration of FBs by adults is rare in our area. However, it is important to suspect bronchoaspiration of a FB in the presence of suggestive symptoms. In adults, respiratory infection (acute or recurrent pneumonia) is the most common clinical presentation. Chest radiography is not always useful for diagnosis. Sometimes metallic FBs can be observed, but other times only indirect signs of alveolar infiltrate are present. Surgical treatment is reserved for cases in which bronchoscopy is unsuccessful or there are irreversible bronchial or lung complications.

This work presents the limitations of a retrospective descriptive study conducted in a hospital that is a Thoracic

Surgery reference centre for six hospitals. In this way, it is possible that cases are partially selected, maybe more difficult, this justifies the higher incidence of surgery in our series.

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