Foreign Bodies in the Laryngotracheobronchial Tree

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Summary: Foreign bodies in the laryngotracheobronchial tree are not uncommon. Their clinical presentations, the radiological and endoscopic findings in sixteen cases that presented to the Department of Otorhinolaryngology, Universiti Kebangsaan Malaysia were reviewed. The technique of removal is also discussed.

INTRODUCTION

Foreign bodies in the laryngotracheobronchial tree are not uncommon. They may mimic pulmonary infections in their clinical and radiological presentations. They are thus often managed as such. In a four-year period between August 1983 and July 1987, sixteen cases of foreign bodies in the laryngotracheobronchial tree were seen and treated in the Department of Otorhinolaryngology, Universiti Kebangsaan Malaysia. In this paper, we document their clinical presentations, the radiological and endoscopic findings.

MATERIAL AND METHODS

The clinical features, radiological findings and management of sixteen consecutive cases of foreign bodies in the laryngotracheobronchial tree that presented to the Department of Otorhinolaryngology, University Kebangsaan Malaysia over a period of four years from August 1983 to July 1987 were reviewed. Relevant clinical data including age, sex, symptomatology, physical signs, radiological findings, and method of treatment were obtained from the records of these patients.

After an Otolaryngologic examination, all patients suspected of having foreign bodies in the laryngotracheobronchial tree were investigated to determine their presence and the site of impaction. These investigations included plain radiography of the neck and the chest. They were then subjected to direct laryngoscopy and/or bronchoscopy under general anaesthesia to confirm the diagnosis. Endoscopic removal of foreign bodies were attempted in all cases using such instruments as microforceps and Fogarty catheter.

RESULTS

Clinical Findings

There were a total of sixteen patients, of which ten (62.5%) were males and six (37.5%) were females. Their ages ranged from nine months to sixty one years (Table 1). The peak incidence was found among the preschool age of 1 – 5 years (37.5%). Thirteen cases (81.25%) were seen in children below the age of twelve.

	No. of Cases
AGE GROUP (YEAR)	
< 1	3 (18.75%)
1 – 5	6 (37.5%)
6 – 12	4 (25%)
13 – 20	nil
21 – 30	2 (12.5%)
> 30	1 (6.25%)
TOTAL	16 (100%)
DURATION OF ENLODGEMENT	
No history available	4 (25%)
24 Hours	3 (18.75%)
1 – 7 days	3 (18.75%)
2 Weeks	3 (18.75%)
1 Month	2 (12.5%)
> 1 Month	1 (6.25%)
TOTAL	16 (100%)
PRESENTING SYMPTOMS	
Persistent Cough	15 (93.75%)
Wheezing	11 (68.75%)
Fever	6 (37.5%)
Dyspnoea	4 (25%)
Haemoptysis	1 (6.25%)
Chest Pain	1 (6.25%)
Hoarseness of voice	1 (6.25%)
PHYSICAL SIGNS	
Rhonchi & Crepitations	11 (68.75%)
Fever	6 (37.5%)
Stridor	4 (25%)
Normal finding	2 (12.5%)
Emphysema	1 (6.25%)
Collapsed lung	1 (6.25%)
Cyanosis	1 (6.25%)

Table 1: Clinical Findings

Twelve (75%) patients gave positive history suggestive of foreign body inhalation. The duration of enlodgement of foreign bodies among the twelve patients varied from 24 hours to a period of two months (Table 1). One patient presented two months after a positive history of inhaling a ballpen cap.

The presenting symptoms and significant clinical features are listed in Table 1. The predominant symptom was persistent cough (93.75%). Wheezing was a common complaint in eleven (68.75%) patients. Constitutional symptoms such

as fever was found in six (37.5%) patients. Four (25%) patients complained of dyspnoea. One (6.25%) patient had hoarseness of voice due to a fish bone which was embedded in the vocal cord.

The presence of rhonchi and crepitations were the commonest physical findings (68.75%), followed by fever (37.5%) and stridor (25%). Two patients (12.5%) had no significant clinical sign. Evidence of emphysema and collapsed lung was found in one patient (6.25%).

Radiological features

The radiological findings are listed in Table 2. The plain radiography of the neck were all normal. Three (18.75) patients however, showed foreign bodies in the bronchi on chest x-ray (Fig. 1). The majority of patients (50%) showed evidence of patchy consolidation (Fig. 2). One patient (6.25%) had emphysema of the right lung (Fig 3). The chest x-rays of three (18.75%) patients were found to be normal. These were found in those patients who presented to us within 24 hours of foreign body inhalation.

Site of enlodgement

The commonest site affected was the right bronchus and was found in 11 (68.75% patients, followed by the larynx (18.75%) and the left bronchus (12.5%). See table 3. None was found in the trachea.

Features	No. of Cases
Normal	3 (18.75%)
Foreign bodies seen	3 (18.75%)
Patchy consolidation	8 (50%)
Emphysema	1 (6.52%)
Collapsed Lung	1 (6.25%)
TOTAL	16 (100%)

Table 2
Radiological Features
(Chest X-Rays)

	No. of Cases
SITE OF ENLODGEMENT	
Larynx	3 (18.75%)
Trachea	nil
Right bronchus	11 (68.75%)
Left bronchus	2 (12.5%)
TOTAL	16 (100%)

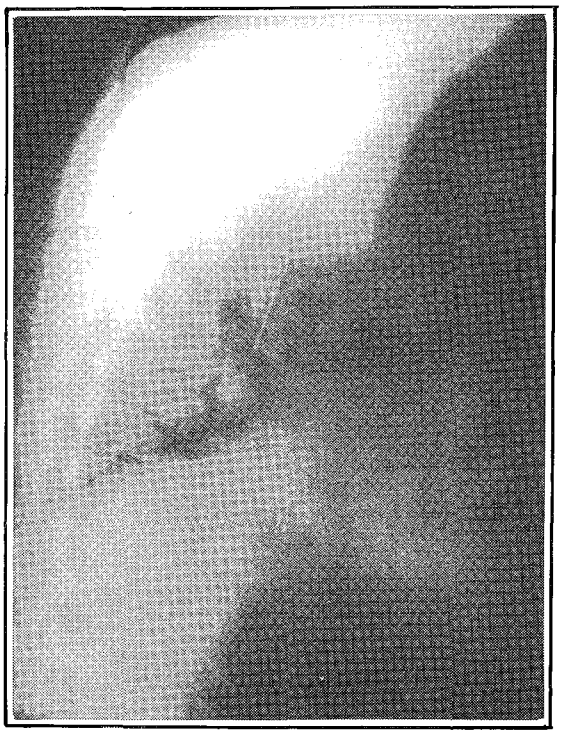

Fig. 1:
Chest X-Ray (lateral view) showing a safety pin in the right main bronchus.

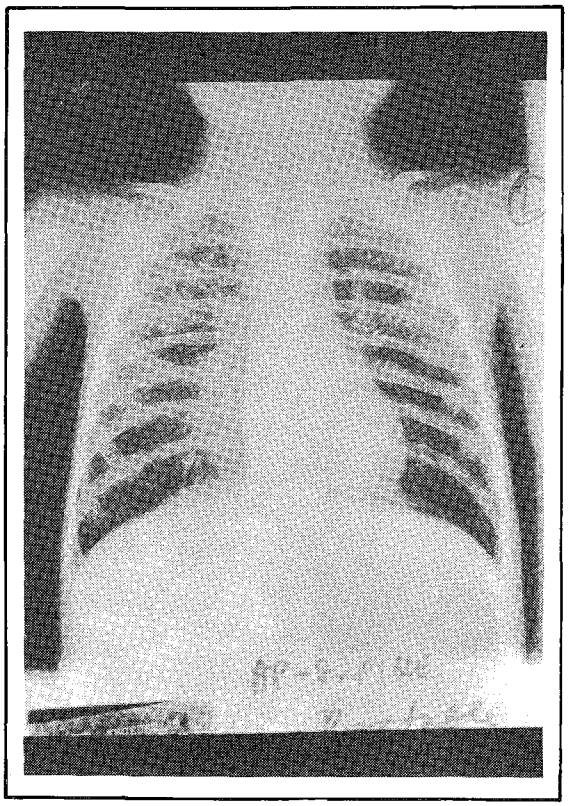

Fig. 2:
Chest X-Ray (Anteroposterior view) showing patchy consolidations consistent with bronchopneumonia.

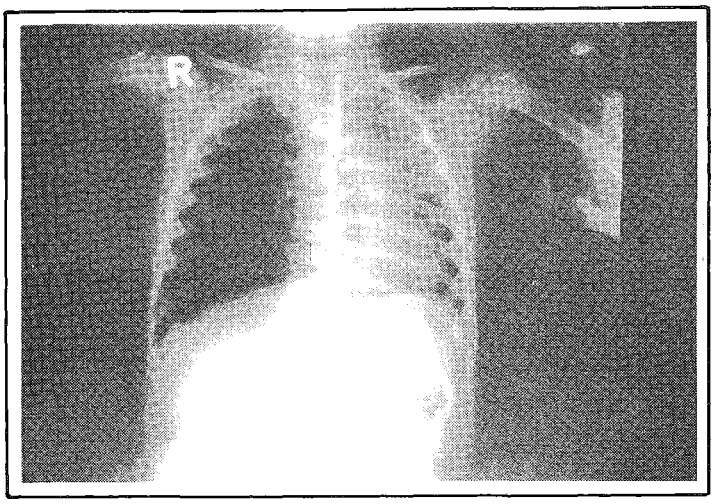

Fig. 3:
Chest X-ray showing right obstructive emphysema due to ball and valve effect of a foreign body.

TYPE OF FOREIGN BODIES		
ORGANIC:		
Vegetative:	Peanut	8 (50%)
	Coconut kernel	1 (6.25%)
Non-vegetative:	Chicken bone	1 (6.25%)
	Fish bone	2 (12.5%)
NON-ORGANIC:		
	Metal	2 (12.5%)
	Plastic	2 (12.5%)
TOTAL		16 (100%)

Table 3:
Site of enlodgement and types of foreign bodies.

Types of foreign bodies

Peanuts were found in 8 (50%) patients. Non-organic foreign bodies were seen in four (25%) patients. These were of metal and plastic material (table 3). One patient had a piece of coconut kernel impacted in the right bronchus (Fig 4).

Treatment

All patients underwent direct laryngoscopy and bronchoscopy under general anaesthesia using the rigid endoscopes. Fifteen (93.75%) patients had successful endoscopic extraction using microforcep and Fogarty catheter. One (6.25%) patient had a thoracotomy after failure of endoscopic removal due to marked impaction of the foreign body. This was in a 12-year old boy with a period of enlodgement of two months, the foreign body being a plastic ballpen cap.

Discussion

Foreign bodies in the laryngotracheobronchial tree are not uncommon. Compared to those in the nose and upper digestive tract, foreign bodies in the laryngotracheobronchial tree carry a higher morbidity and mortality.

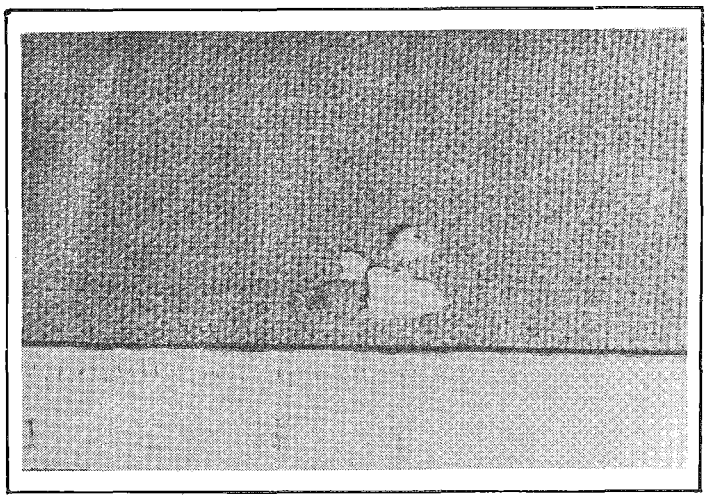

Fig. 4 :
Pieces of coconut kernel extracted from a patient's right bronchus.

Incidence

Children are more frequently affected than adults by virtue of their inherent playful habit of placing objects loosely in their mouths and noses. The mean age affected is 3.5 years.[1] The average age usually varies from two to eight years though it is not uncommon to find cases beyond this age range. These compared well with our series where 81.25% of patients were below 12 years old while the age ranged from 9 months to 61 years. While this is mainly due to the playful nature of children it is rather difficult to fully explain the higher incidence in males; 3:2 ratio along similar logic. This ratio of 3:2 is seen in this series as well as others.[2]

Site of enlodgement

Accidents occur when a sudden inspiration is taken while an object is in the mouth or nose. Many series have found foreign bodies in the right bronchus accounting for approximately 80% of cases.[2,3] The incidence of foreign bodies in the larynx and trachea are lower, ranging from four to 20%.[2,4,5] This is due to the fact that foreign objects when small tend to be inhaled directly into the bronchus except for sharp pointed or big objects; they have higher tendencies to be impacted in the larynx or trachea. Foreign bodies in these sites carry a higher mortality and morbidity rate as respiratory embarassment is more severe compared to those in the bronchi. Most authors agree on the higher incidence in the right main bronchus as compared to the left.[1,6,7] This is also seen in our series where 68.75% of foreign bodies were found in the right main bronchus. This is probably explained by (i) greater diameter on the right main bronchus (ii) thus the greater volume of air entry to the right side (iii) the lesser degree of deviation the right main bronchus makes with the tracheal axis (iv) the position of the carina being slightly to the left.

Types of foreign bodies

Despite the plethora of foreign bodies seen and removed in the laryngotracheobronchial tree most authors[1,4,5] report nuts and other vegetative matter as the commonest, followed by plastic and metallic objects. Fifty percent of our patients had peanuts lodged in their laryngotracheobronchial tree (Table 3).

Clinical features

The clinical features of foreign bodies in the laryngotracheobronchial tree are influenced by the site of enlodgement, type of foreign bodies and period of enlodgement.[4] Not in all cases will one find a positive history. A negative history is present in about 15% of cases.[4] We found a higher incidence of negative history in 25% of casea probably due to (a) patient denial especially in children who may be frightened to mention it (b) child being unattended to. The positive history would include direct or accidental inhalation of the foreign bodies. However, a history of choking, coughing or gagging may indicate foreign body inhalation and is the more common presenting history. This is then followed, in the majority of cases, by a variable asymptomatic period.

Following the asymptomatic period a few general symptoms common to all types of foreign bodies appear which include (a) cough with or without dyspnoea (b) expectoration and (c) asthmatoid wheeze.[3] This is segmental rather than generalised. As seen in our series, cough accounts for 93.75% of the presenting symptoms followed by wheezing in 68.75% of cases.

The occurrence of other symptoms depends upon the nature of the foreign body; whether it is vegetative or non vegetative. Vegetative foreign bodies produce intense tissue reaction. This may be a specific allergic reaction to vegetable oil liberated by the swelling object. Symptoms of acute tracheitis and bronchitis may be present and the patient is obviously ill. Bronchial obstruction is usually marked.

Non-vegetative foreign bodies tend to gravitate in the lower lobe bronchi. Their progress depend upon the size and shape. Little or no inflammatory reaction occur in the bronchial mucosa at first. Granulation may form later and cause hemoptysis as seen in 6% of cases in our series. Atelectasis occurs if the lobe of the lung is completely obstructed with subsequent danger of infection. An obstructive emphysema occurs if a lobe is partially obstructed. Hard or metallic objects may be present for months without producing symptoms.

Physical signs correspond to symptomatic changes. At first there may be no signs apart from tracheal or bronchial irritation. Signs of bronchial obstructions occur later with wheezing, rales and evidence of emphysema, atelectasis, acute tracheal bronchitis or lung abscess.

These clinical features mimic conditions such as bronchiolities or asthma and the diagnosis may be missed quite easily. Sudden wheezing in a child with no previous family history of asthma should arouse a strong suspicion of a foreign body.

Radiological findings

Radiographic changes may occur immediately following aspiration or may become apparent later as infection and obstruction sets in. Non radioopaque material may be missed on X-rays but it must be suspected when the films show atelectasis, obstructive emphysema, mediastinal shift or consolidation of the lung. This is well illustrated in the radiological findings in Table 2 where only 18.75% show the presence of foreign body. This figure is confirmed by most reports.[1] More important are pneumonic changes which occurred in about 50% of patients (Table 2).

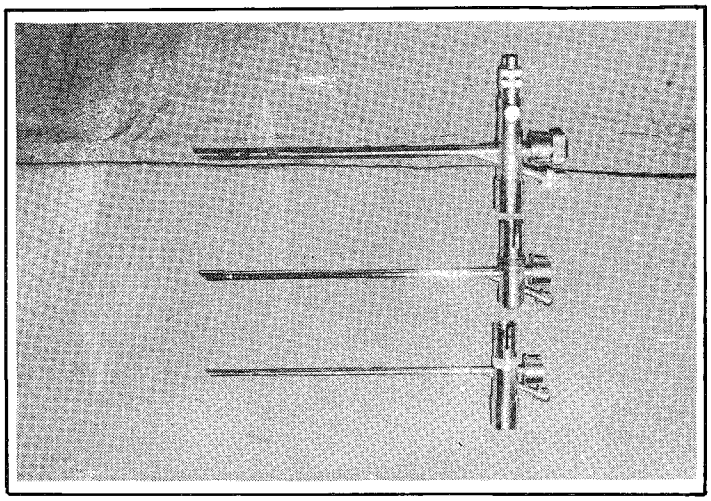

Fig. 5:
Various sizes of paediatric bronchoscopes.

Management

In the removal of foreign bodies in the laryngotracheobronchial tree, there is no substitute for the open rigid endoscope (Fig. 5). All techniques which are used for aiding the obstructed patient in an emergency, such as pounding the back, postural drainage, bronchodilators, finger probing of the throat and Heimlich procedures, are dangerous and should be discouraged unless there is no choice because of obstruction of the airway which is unrelieved by the patient's own reflex. All these techniques may cause further impaction and possibility of total obstruction not present prior to these attempts.

The endoscopic technique requires an experienced and skilful endoscopist in concert with a compatible, experienced anaesthesiologist. The airway is shared by both endoscopist and anaesthesiologist. Therefore the maintenance of adequate ventilation which is of the highest priority is totally dependent on these two members of the team. Each must concentrate in maintaining the airway with adequate ventilation at all times and there can be no compromising of this need for even a single moment.

The choice of anaesthesia should be one which permits intermittent ease of ventilating the lungs and allows sufficient time for the atraumatic manipulations of the bronchoscope. These needs can be achieved by using a controlled apneic technique which consists of a light plane of general anaesthesia accompanied by a muscle relaxant. Safety of the anaesthesia is improved by the administration of 95 to 100% oxygen just prior to and during the apnea. This procedure establishes a high pulmonary reservoir of oxygen as well as complete saturation of the arterial blood and delays the onset of hypoxia.

As soon as the bronchoscope is placed into the trachea, the side arm of the bronchoscope is attached to the circle absorption system by means of a short, flexible rubber tube, and the lungs are ventilated again with a high concentration of oxygen. At frequent intervals throughout the procedure the respirations are intermittently controlled by simultaneous occlusion of the open end of the bronchoscope with the endoscopist's thumb while the anaesthetist manually compresses the breathing bag.

This anaesthetic technique facilitates both the endoscopic procedure and the removal of the foreign body. It reduces trauma to the anatomic structures invaded by the endoscope, eliminates discomfort and gives complete compliance on the part of the patient without restraints.

Gentleness is paramount for successful bronchoscopy, the tissues must be handled with care, and patience should replace speed in manipulation.

Correct use of instruments are essential. There are many grasping forceps available for the removal of foreign bodies in the laryngotracheobronchial tree, but on rare occasions a Fogarty catheter is useful in dislodging an impacted smooth foreign body (Fig. 6 & 7). They must be kept in good condition, otherwise these instruments may break off during use, and this may have to be removed also.

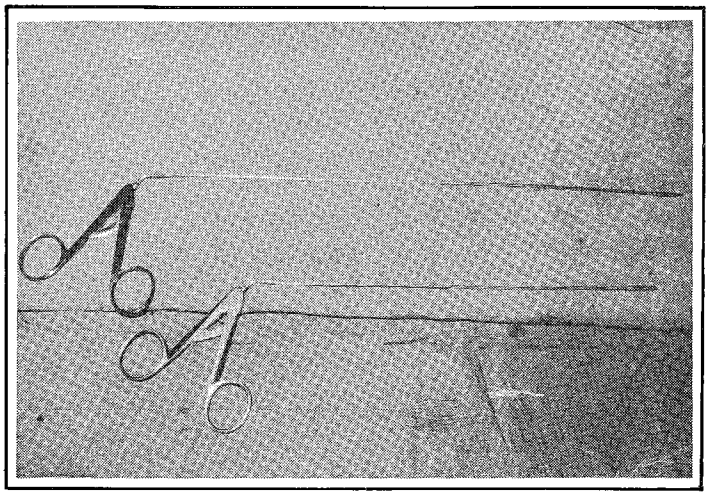

Fig. 6 :
Microforceps used in the extraction of foreign bodies through the endoscopes.

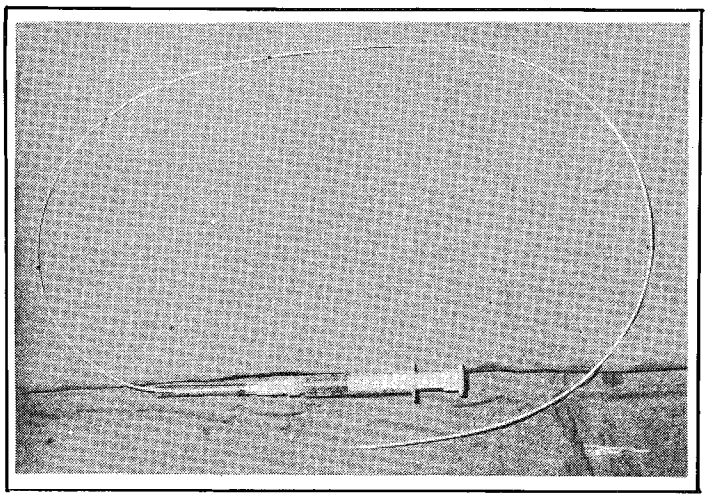

Fig. 7: Fogarty catheter.

Tracheostomy may be necessary in laryngeal or upper tracheal foreign bodies prior to endoscopy. Blind endoscopic procedures in these cases may push the foreign body lower down the tracheal lumen and may get lodged at the carina causing complete obstruction and sudden death. In difficult and prolonged endoscopic procedures, post operative tracheostomy may be avoided by the use of nasotracheal intubation with IPPR using steroid and antibiotic therapy for 48 – 72 hours to allow laryngeal oedema to settle down.

Should bronchoscopy fail to extract impacted foreign body, the assitance of the thoracic surgeon should be sought with a view to thoracotomy. In our experience, we have been successful in using the endoscopic technique in all cases except in one patient who had to undergo a formal thoracotomy. This was performed on the patient who had a ball pen cap for almost two months in the right inferior lobe bronchus. Disimpaction was unsuccessful due to the presence of marked granulation causing local bleeding.

Acknowledgement

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