Case Series of Bronchoscopic Removal of Tracheobronchial Foreign Body in Six Adults

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Abstract

Tracheobronchial foreign body is rare in adults. Diagnosis is difficult and requires a high index of suspicion. We report 6 cases of tracheobronchial foreign bodies in adults and their removal, as well as a literature review of this topic. Case records, chest radiographs and computed tomographies (CT) of the thorax were reviewed. There were 5 males and 1 female with a median age of 63.5 years. One patient could not protect his airway (tracheostomy). Foreign bodies were sutures (2), vegetable matter like peanuts, vegetables and popcorn (3), and a voice prosthesis. Main symptoms were cough, haemoptysis and breathlessness. There were few signs on physical examination and chest X-rays were not helpful in diagnosis. All patients had fibreoptic bronchoscopy although 3 subsequently required rigid bronchoscopy for foreign body removal. All foreign bodies were successfully removed without any complications.

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Key words: Aspiration, Bronchoscopy, Fogarthy balloon catheter, Forceps, Haemoptysis

Introduction

Gustav Killian reported the first case of bronchoscopic removal of foreign body (FB) from the trachea in 1897.[1] Since then, rigid bronchoscopy under general anaesthesia by the cardiothoracic surgeon has remained the procedure of choice for FB removal in the airways, failing which thoracotomy and bronchotomy is performed. In 1974, Zavala and Rhodes[2,3] demonstrated the use of flexible fibreoptic bronchoscopy to remove FB in artificial lungs and animals. Many authors have since also used flexible fibreoptic bronchoscopes for FB extraction.[4,5] Although tracheobronchial FB is common in children, it remains rare in the adult population and there are only a few publications on this topic. We present our experience with 6 cases of tracheobronchial FB over a 2-year period and review the available literature.

Materials and Methods

All cases with confirmed tracheobronchial FB between 1 January 1996 and 31 December 1997 were studied in this retrospective survey. The setting is that of a tertiary referral teaching hospital which also takes direct admissions from the emergency room. Case records were reviewed with respect to the clinical presentation, duration of symptoms, predisposing conditions, clinical signs, complications, diagnosis and treatment of tracheobronchial FB. All radiographic investigations were also reviewed. Flexible fibreoptic bronchoscopy was performed under local anaesthesia with 4% lignocaine spray and intravenous sedation with midazolam. In general, flexible fibreoptic bronchoscopy was used in the initial diagnosis and assessment of tracheobronchial FB. Removal with flexible fibreoptic bronchoscopy would first be attempted, and only when it failed did we proceed to rigid bronchoscopy which was performed under general anaesthesia using the Dumon-Harrell rigid bronchoscope. Laser photoresection was accomplished using the Nd:YAG laser.

Results

Six patients were diagnosed to have tracheobronchial FB during the 2-year study period. Table I shows a breakdown of their clinical presentation, types and sites of foreign bodies and bronchoscopic treatment. There were 5 males and 1 female, and the median age was 63.5 years (range 45 to 69 years). Cough (3), breathlessness (3) and haemoptysis (3) were the main presenting com-

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TABLE I: CLINICAL PRESENTATION, TYPES AND SITES OF FOREIGN BODIES, AND TREATMENT OF THE 6 PATIENTS WITH TRACHEOBRONCHIAL FOREIGN BODIES

No.	Sex/Age	Symptom	Duration of symptoms	Signs	Foreign body	Chest X-ray	Site	Bronchoscopic removal
1.	M/64	breathless, chest pain, fever	3 months	wheeze	peanuts	LUL infiltrates	LUL	flexible
2.	F/57	haemoptysis	7 months	nil	suture	normal	RUL	rigid
3.	M/65	haemoptysis, cough, chest pain	4 months	nil	suture	right hilar staples	RUL	rigid
4.	M/63	breathless, cough	1 day	nil	voice prosthesis	not done	RMS	flexible
5.	M/69	cough, breathless	1 day	wheeze	peanuts, vegetables	normal	RLL	rigid
6.	M/45	haemoptysis	1 week	nil	popcorn	normal	LLL	flexible

LLL: left lower lobe; LUL: left upper lobe; RLL: right lower lobe; RMS: right main stem; RUL: right upper lobe

plaints. The duration of symptoms varied widely, ranging from within the same day to 7 months before diagnosis was made (mean was 71.5 days).

Two patients presented acutely with respiratory distress requiring intubation and ventilatory support. One patient aspirated noodles and vegetables while eating. The second patient previously had total laryngectomy and tracheostomy for carcinoma of larynx, and he accidentally aspirated a tracheoesophageal voice prosthesis (Fig. 1) through the tracheostomy stoma. They were the only 2 patients who were aware of their FB aspiration. Non-localised wheeze was present in only 2 patients (30%). Chest X-rays did not show any FB in all 6 patients. Computer tomography (CT) of thorax was done in 2 patients, both of which were not diagnostic.

All patients underwent flexible fibreoptic bronchoscopy to confirm the diagnosis of tracheobronchial FB. One patient was referred for FB removal after diagnosis was made by a private pulmonologist with flexible fibreoptic bronchoscopy. The locations of FB were right upper lobe bronchial stump (2), right main stem bronchus (1), right lower lobe bronchus (1), left upper lobe bronchus (1) and left lower lobe bronchus (1). Both right upper lobe FBs were due to suture material from previous lobectomies.

Three patients had their FB removed using flexible bronchoscopy. Toothed biopsy forceps was used in all cases and oesophageal balloon catheter was also used in the third case. These were inserted through the working channel of the fibreoptic bronchoscope. Flexible bronchoscopy was performed through a tracheostomy tube in 1 patient.

Three patients required rigid bronchoscopy for FB removal. Toothed foreign body forceps was used in all cases and a Fogarty balloon catheter was also used in 1 case. Both patients with right upper lobectomy stump sutures underwent rigid bronchoscopy for their removal. Nd:YAG laser was used in 1 patient to resect the granuloma and help secure haemostasis.

Types of FB were as follows: food material like peanuts, vegetables and popcorn (3) (Fig. 2), sutures (2) (Fig. 3), and tracheoesophageal voice prosthesis (1). Chronic granulomas were present in 3 patients. There were no complications from the procedures and symptoms resolved in all patients after FB removal. One patient with post-obstructive pneumonia was successfully treated with oral antibiotics after FB removal.

Discussion

Tracheobronchial FB is commoner in children than adults.[6-9] Its true incidence is difficult to assess, as symptoms are not specific, especially if they are subacute or chronic. Patients with acute symptoms tend to volunteer an aspiration history (100%) while those with chronic history do not (3.4%).[10] In our series, both patients with acute symptoms were able to volunteer a history of aspirating FB. Most patients present with cough, fever, haemoptysis and dyspnoea.[10,11] Limper and Prakash[11] retrospectively studied 60 patients at Mayo Clinic and found that 94% had cough, 23% had fever, 19% had haemoptysis and 17% had dyspnoea. McGuirt et al[12] reported cough and fever in 28% and 17% of patients respectively. In addition wheezing was present in 28% of their series of 88 patients. Haemoptysis, if present, tends to be mild. Specific signs were lacking in most patients.[12] In our series wheezing was present in 30% of patients. The commonest sign reported by McGuirt et al was decreased breath sounds (47%) while wheezing was present in only 9% of patients.

Chest X-rays are frequently used in the assessment of patients with respiratory complaints. Diagnosis would be more obvious in patients with radiopaque FB. However radiolucent FB may pose a problem as they are often missed. Other radiographic signs that may help in the diagnosis of tracheobronchial FB include atelectasis, post-obstructive pneumonia and air trapping.[5,8-12] When present, they should alert the attending physician to the possibility of aspirated FB, and more specific investigations should be carried out. In their series, Limper and Prakash found the standard chest X-ray to be useful in

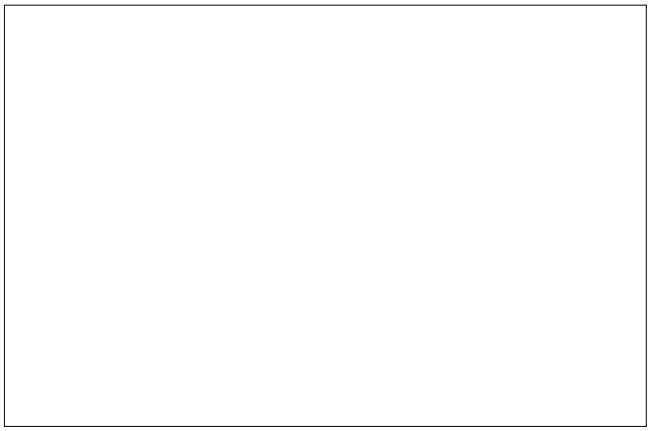

Fig. 1. Tracheoesophageal voice prosthesis that was aspirated through the tracheostomy stoma in a man with total laryngectomy.

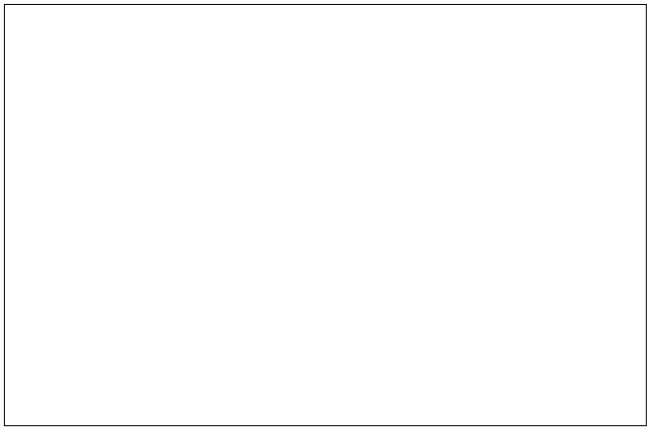

Fig. 2. Popcorn removed from the left lower lobe in a man with haemoptysis.

72% of patients for locating the site of FB impaction. This was also shown by Svedstrom et al[13] who reported 67.7% positive chest X-rays in bronchoscopically-proven tracheobronchial FB (sensitivity of 67% and specificity of 68%). Mu et al[14] reviewed 343 children with proven tracheobronchial FB and found that 62.7% had positive X-ray findings. In this series, radiopaque objects were identified in only 6.6% of cases. Their main radiographic findings were obstructive emphysema, mediastinal shift, pneumonia and atelectasis. As expected mainstem bronchial FB tend to cause obstructive emphysema (40%) and mediastinal shift (35%). More than 50% of patients with early diagnosis (<24 hours) had normal chest X-rays. Chest X-rays were not diagnostic in all our patients. This might have resulted from the small numbers involved, and 2 of the cases were suture retention. Inspiratory and expiratory chest X-ray films can be compared for mediastinal shift during expiration, indicating a unilateral bronchial obstruction. Fluoroscopy has been used to help locate FB, especially before bronchoscopy. It is also useful for assessment of mediastinal shift during expiration. Other radiological investigations like localised tomography, computed tomography or bronchography are rarely required to diagnose an occult FB.

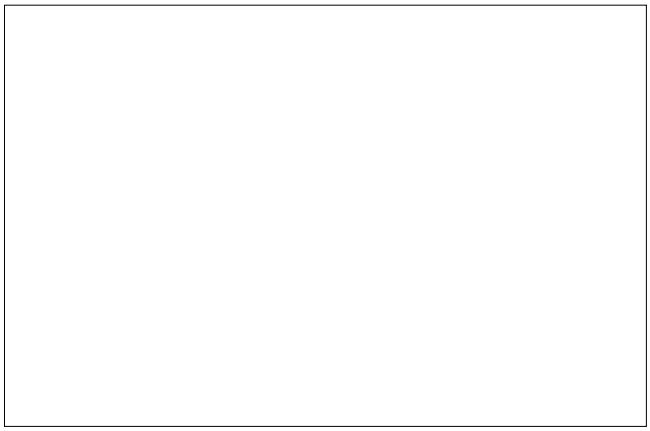

Fig. 3. Retained suture in the right upper lobe bronchial stump causing haemoptysis.

FB aspiration may be occult and remain undiagnosed for years.[15] The longest duration of symptoms in our patients was 7 months before diagnosis was made. Wolkove et al[15] described 3 cases of occult tracheobronchial FB and the longest duration of symptom was 7 months. Weissberg and Schwartz[16] reported a patient whose chicken breast bone was impacted in her bronchus intermedius with resulting bronchiectasis for 12 years. A high index of suspicion is therefore necessary, especially if there are predisposing factors like neurological deficits, sedative or alcohol use. This is because symptoms are not specific and chest X-rays may be negative. A history of choking should raise the suspicion even more.

The procedure of choice for initial evaluation is flexible fibreoptic bronchoscopy.[17] It can be performed under local anaesthesia with few risks and complications, and it allows the exact site of lodgement to be determined. Smaller airways can also be examined by this technique. An anatomical variation of the bronchial tree and body posture at the time of FB aspiration determines the site of lodgement. FBs are predominantly impacted in the right side.[11,12,16] Limper and Prakash[11] reported right lower lobe FB in 17 (28.3%) of their 60 patients. Bronchus intermedius and right lower lobe bronchus involvement were similar in the 47 patients described by Lan.[10] However, McGuirt et al[12] found the right main stem bronchus to be the most common site of FB impaction [32 (36%) out of 47 cases]. Other authors have found a left-sided predominance[18] or an equal distribution.[19]

The type of FBs has changed over the years. In 1936, Jackson and Jackson[20] found that more than 50% of tracheobronchial FBs to be non-organic matter like shawl pins and safety pins. However, Limper and Prakash[11] reported in 1990 that the commonest FB in their series was vegetable matter. Findings similar to Limper and Prakash were also reported by McGuirt et al[12] and Lan et al.[4] The common culprits being peanut, popcorn,

bones and vegetable.

Factors predisposing adults to FB aspiration were frequently present. Fifty-two of 60 patients reported by Limper and Prakash had one predisposing factor.[11] They found that medical and dental procedures combined accounted for 40% of the predisposing factors. Neurological disorders were next with 19% while alcohol or sedative use accounted for 10%. Whitlock et al[5] also noted that excessive alcohol consumption and senile dementia were present in their 3 patients with tracheobronchial FB aspiration. Tracheostomy in one of our patients was a predisposing factor. He accidentally aspirated a tracheoesophageal voice prosthesis as the protective mechanism of the larynx was lost. Previous lung surgery predisposes to suture granuloma, which can cause chronic cough and haemoptysis. This was the case in 2 of our patients. Removal of these non-absorbable sutures resulted in prompt resolution of symptoms.

Should FB be removed? To answer this question, we have to consider the complications of retained FB and the risks involved in FB removal. Complications of tracheobronchial FB include asphyxiation, post-obstructive pneumonia, haemoptysis, foreign body granuloma, bronchiectasis, atelectasis and chronic cough.[11,12,15] In our series, 2 patients suffered life-threatening respiratory distress after aspirating FB. Haemoptysis is common but tends to be mild.[10] Recurrent pneumonia and bronchiectasis can persist for some time before diagnosis. They resolve with antibiotics after FBs are removed.[15] McGuirt et al[12] reported a case which the retained FB eroded into a pulmonary vessel to cause fatal haemorrhage. Risks of both flexible and rigid bronchoscopy are low. The main complications are hypoxaemia, haemorrhage and pneumothorax. They are mild and rare in comparison with those of retained FB. Therefore, once detected, the FB should be removed as soon as possible as technical difficulties increase with time due to mucosal inflammation.[17] Mu et al[14] also found that complication rate increases with time to more than 60% after 24 hours compared to 44% within 24 hours.

Rigid bronchoscopy has been the gold standard for the removal of tracheobronchial FB for many years. This is especially so in children. However, recent improvements in technique and equipment for flexible fibreoptic bronchoscopy make it a valuable tool for FB removal in adults. Rigid bronchoscopy has the advantage of a large working channel, which permits the use of a bigger variety of instruments. Rigid forceps allows both pulling as well as rotation which is not possible with flexible forceps. Moreover, rigid forceps offers a better grip than the flexible forceps. This is advantageous if the FB is deeply embedded in granulation tissue. Good airway control is the other major advantage of rigid bronchoscopy, ensuring a rapid and safe FB extraction. Limper and Prakash[11] noted some of the above advantages and found a higher success with rigid bronchoscopy (98% compared to 60% with flexible bronchoscopy). However, Lan et al[4] demonstrated that flexible bronchoscopy was safe and useful in tracheobronchial FB retrieval. Flexible fibreoptic bronchoscopy is particularly useful in cases where FBs are impacted too distally for the rigid bronchoscope to reach. The other situations where flexible bronchoscopy may be useful are patients with cervical instability and mechanically ventilated patients, where rigid bronchoscope insertion becomes difficult. Another advantage of flexible bronchoscopy over rigid bronchoscopy is that it is done under local anaesthesia and intravenous sedation. Rigid bronchoscopy requires general anaesthesia, which may be risky for some patients. There are however no studies to confirm the superiority of rigid bronchoscopy over flexible fibreoptic bronchoscopy for FB removal in adults. The choice of technique also depends on the training, expertise and preference of the bronchoscopist. Complications are minimal with either rigid or flexible bronchoscopy. Limper and Prakash[11] reported an overall rate of 5%. Mild bleeding was the main complication and abated spontaneously in all cases.

In conclusion, tracheobronchial FB is uncommon in adults. Its diagnosis depends on a high index of suspicion as symptoms and signs are not specific. Chest radiographs may pick up radiopaque FB but radiolucent objects may be missed. Flexible fibreoptic bronchoscopy is the diagnostic investigation of choice. Once identified, FB should be removed as early as possible. Removal of FBs can be done using either flexible fibreoptic or rigid bronchoscopy, although an attempt should be made with the former initially.

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