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# Traheobronchial foreign bodies: evaluation and retrieval by rigid bronchoscopy

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## ABSTRACT

**Background:** The foreign body aspiration is one of the commonest ENT emergencies. Delay in diagnosis and treatment may lead to significant morbidity and mortality.
**Methods:** The current study was conducted at Department of Otorhinolaryngology and Head and Neck Surgery, SMGS Hospital, Government Medical College, Jammu, from November 2017 to October 2018. All symptomatic patients diagnosed with foreign body aspiration on the basis of history, clinical examination and radiological evaluation and who underwent rigid bronchoscopic retrieval were included in the study. Fifty patients were studied.
**Results:** The majority of patients 33 (66%) were between 1 and 3 years of age.12 (24%) patients were over 3 years of age with oldest of 57 years old age with male: female ratio of 2.1:1. The clinical features of these patients were mainly cough, respiratory distress, wheeze, fever, stridor, choking and cyanosis. On bronchoscopy, foreign body was identified in 46 (92%) patients and no foreign body was seen in 4 (8%) patients with suspected foreign body aspiration. The most common type of foreign body was organic (73.91%), with peanuts (47.82%) being the commonest. The most common site was left bronchus seen in 22 (47.83%) patients followed by right bronchus seen in 18 (39.13%) and trachea seen in 6 (13.04%) patients. Overall mortality and morbidity rates were 2.17% and 4.35% respectively.
**Conclusions:** History and clinical examination should be more relied upon as diagnostic tool than radiological findings in diagnosing foreign body inhalation. Rigid bronchoscopic removal of foreign body is the standard procedure for removing tracheobronchial foreign bodies.

**Keywords:** Bronchus, Foreign body, Inhalation

## INTRODUCTION

Tracheobronchial foreign body is one of the most common pediatric emergencies. More than half of the children with foreign body aspiration are under 4 years of age and more than 70% are under 8 years of age.[1] Foreign body aspiration is less frequent in adults and commonly seen after 6$^{th}$ decade and is often associated with alcoholic ingestion, traumatic intubation, seizures, parkinsons disease and dental procedures.[2]

Early diagnosis and removal of foreign body is mandatory in order to prevent tracheobronchial foreign body related complications and mortality.[3] The diagnosis of foreign body aspiration is based on history, clinical and radiological investigation. Chest radiography, computed tomography (CT) and rigid bronchoscopy are commonly used in the diagnosis of foreign body aspiration.[4] According to various studies, right main bronchus is the most common site, since the right main bronchus is wider than left and interbronchial septum

projects towards left.[5] The gold standard for treatment of foreign body aspiration is rigid bronchoscopy with forceps removal. However, in cases of failed rigid bronchoscopy, the surgical options available for retrieving the foreign body include tracheostomy, bronchotomy and thoracotomy.[6]

Tracheobronchial foreign body aspirations generally present with symptoms of coughing, dyspnea, wheezing and also very rarely with stridor and cyanosis. In cases with delayed diagnosis the unilateral subsidence of breath sounds, audible ronchi, persistent coughing and repetitive pneumonia may be observed, unexplained persistent fever, a fever associated with persistent respiratory symptoms which continue inspite of treatment and persistent or recurrent lobar pneumonia demand a diagnostic bronchoscopy to rule out a foreign body.[7]

Chest radiograph must be obtained in all cases of suspected foreign body aspiration even in the absence of clinical symptoms. Negative radiological finding should not preclude bronchoscopy in patients with characteristic symtoms.[8]

The most common objects to be aspirated are peanuts, food, plastic, metal, popcorn, bone, fruit. In contrast to inorganic foreign bodies such as toy parts, pen caps, pins, organic foreign bodies are more inductive to inflammatory reactions and symptoms of fever and pneumonia are observed more frequently.[9]

In view of the above mentioned observations about the tracheobronchial foreign bodies the present study was undertaken to evaluate various symptoms and signs of tracheobronchial foreign bodies and also to evaluate the incidence of positive history of foreign body inhalation given by the parents. This study intends to record the time of presentation, age of foreign body inhalation, location and side of foreign body lodgement in lower airway, number of negative bronchoscopies for suspected foreign bodies, time taken for retrieval of foreign bodies and complications and mortality during the procedure.

## METHODS

The current study was conducted at Department of Otorhinolaryngology and Head and Neck Surgery, SMGS Hospital, Government Medical College, Jammu, from November 2017 to October 2018. Approval for this study was obtained from Institutional Ethical Committee.

All symptomatic patients diagnosed with foreign body aspiration on the basis of history, clinical examination and radiological evaluation and who underwent rigid bronchoscopic retrieval were included in the study.

The selection criteria of patients was are as follows: (1) symptoms: history of foreign body aspiration, cough, choking, wheezing, breathlessness, cyanosis, fever, chest pain, (2) clinical findings: unilateral wheeze, decreased air entry, crackles, (3) chest radiography: unilateral or lobar hyperlucency, localized atelectasis, localized pulmonary infiltrates and (4) evidence of foreign body on virtual bronchoscopy.

The decision to perform bronchoscopy was based on clinical history, signs/symptoms, physical examination, radiological findings. All patients underwent rigid bronchoscopy under general anesthesia. Apneic oxygenation was used as a method of ventilation. The size of bronchoscope was determined according to child's age. After induction of anaesthesia direct laryngoscopy was performed and bronchoscope was inserted with the help of laryngoscope. The tracheobronchial tree was examined and the foreign body was extracted using foreign body forceps. Following extraction, check bronchoscopy was performed once again to check for any remnant foreign body and to examine the tracheobronchial tree after removal. Antibiotics, corticosteroids and bronchodilators were administered to the patient. All the findings were recorded in a prescribed performa.

### *Data collection and analysis*

The following demographic data were collected and analysed: age, sex, type, location, duration, removal and complications. The variables were compared using the Pearsons's Chi-square test, the continuity correction chi-square test or Fischer's exact test as appropriate. Additionally, $p<0.05$ was selected to indicate a significant difference. The data were analysed using SPSS version 22.

## RESULTS

Fifty patients were included in the study. The following observations were made.

### *Age and sex distribution of patients*

The majority of patients were between 1 and 3 years of age i.e., 33 (66%). 5 (10%) patients were under 1 year of age (10%). 12 (24%) patients were over 3 years of age with oldest of 57 years old age.

There were 34 (68%) male patients and 16 (32% female patients with male: female ratio of 2.1:1 (Figure 1).

The clinical featured of these patients were mainly cough, respiratory distress, wheeze, fever, stridor, choking and cyanosis in decreasing order (Figure 2).

### *Physical examination findings and radiological findings*

On auscultation of airways, 80% of patients had decreased air entry followed by unilateral wheeze in 50% and crackles in 10% patients (Figure 3).

Only 10% of aspirated foreign bodies were spot diagnosed on X-ray chest as they were radio opaque. Other findings were emphysema (44%), atelectasis and pneumonitis (18%), and 32% patients had normal X-ray findings. In presence of positive clinical diagnosis and inconclusive chest radiography, CT virtual bronchoscopy was carried out in 21 patients. In all 21 patients virtual bronchoscopy showed foreign body and when compared with gold standard bronchoscopic finding, in 19 cases it came as true. Rigid bronchoscopy confirmed the same result but in two patients impacted mucus plug was present in left bronchus.

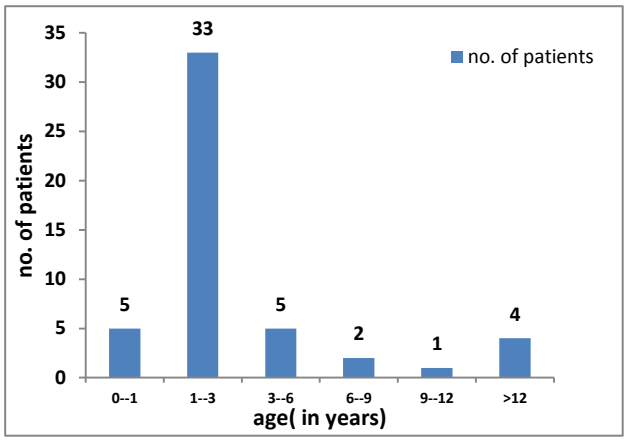


**Figure 1: Age distribution of patients.**

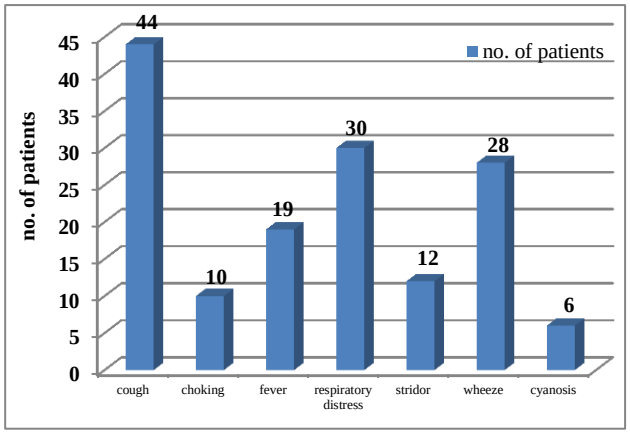


**Figure 2: Clinical symptoms of patients.**

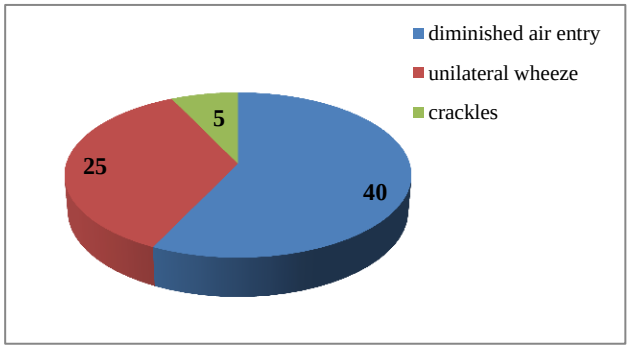


**Figure 3: Physical examination findings.**

***Type of foreign body***

On bronchoscopy, foreign body was identified in 46 (92%) patients and no foreign body was seen in 4 (8%) patients with suspected foreign body aspiration. The most common type of foreign body was organic (73.91%), with peanuts (47.82%) being the commonest. Others were almond, walnut, maize seed, rajma seed, fruit seed and fish bone. Stone and whistle were common among inorganic foreign bodies accounting for 8.7% each respectively (Figure 4).

***Site of lodgement***

The most common site was left bronchus seen in 22 (47.83%) patients followed by right bronchus seen in 18 (39.13%) and trachea seen in 6 (13.04%) patients (Figure 5).

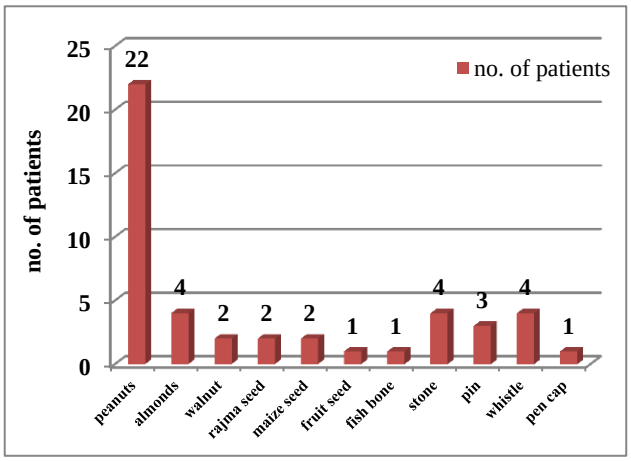


**Figure 4: Type of foreign body.**

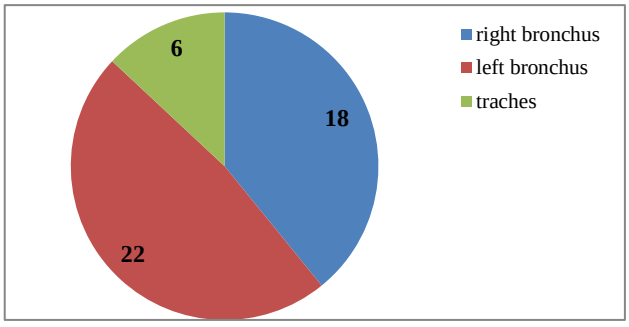


**Figure 5: Site of lodgement of foreign body.**

***Time duration from aspiration to treatment***

Time duration from aspiration of foreign body to treatment procedure was divided into three categories with the criteria of 24 and 72 hrs. Therefore, 25 patients, accounting for 50% were treated within 24 hrs from the aspiration event, 10 (20%) were treated between 24 and 72 hrs and 15 (30%) were treated at 3 days or more after the aspiration event, ranging from 3 to 30 days.

***Treatment outcome and complications***

At bronchoscopy, foreign body was found in 46 patients. In 45 (97.83%) of the patients, foreign body was removed successfully during bronchoscopy. In 1 patient, who suffered severe respiratory distress and cyanosis due to foreign body aspiration, foreign body was removed successfully but during the postoperative period condition did not improve. Post bronchoscopy chest radiograph showed atelectasis of left lung and on second day, patient developed cardiopulmonary arrest without recovery and expired. Overall mortality rate is 2.17%.

Tracheostomy was done in 2 patients because of respiratory distress following extraction of foreign body. Both the patients were decannulated in first week postoperatively. All the patients did well postoperatively and most were discharged in second postoperative day. Overall, morbidity is 4.35% (Figure 6).

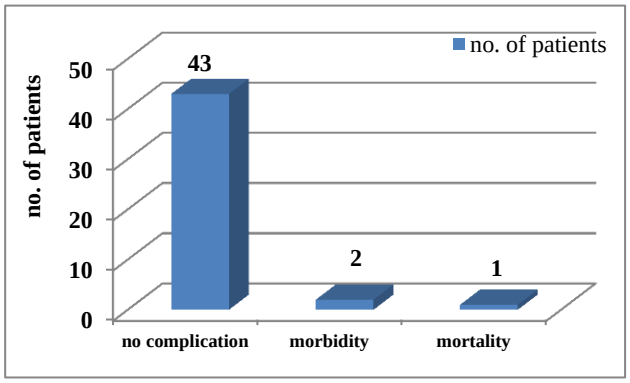


**Figure 6: Treatment outcome.**

## DISCUSSION

Foreign body aspiration in tracheobronchial tree is one of the common problems met with day to day otorhinolaryngological practice and the victims are mainly children. A careful history and physical examination were strong indicators of the diagnosis and raise the index of suspicion of an aspirated foreign body.[10]

In our study, 68% patients were male and 32% were females with M:F of 2.1:1. According to census of India in Jammu and Kashmir M:F is 1.13:1 and this may be a factor for male preponderance in our study, more aggressive nature of males may also be a contributory factor male dominance. Similar M:F ratio was shown by Bodart et al. and Kim et al in their studies.[6,11]

In our study 76% children belonged to less than 3 years and most (66%) were within 1-3 years of age and 24% were above 3 years of age which is in accordance with the study of Zarella et al.[12]

This higher incidence of foreign body aspiration in children less than 3 years may be due to lack of molars necessary for proper grinding of food, the tendency to explore environment by placing objects in mouth and inadequate chewing of food.

In our study, a definitive history of foreign body aspiration while holding or eating an object in mouth was seen in 78% cases. Similar findings were noted by Sinha et al with positive history of foreign body aspiration in 80% cases.[13]

In present study, the main presenting features were cough (88%), respiratory distress (60%) and wheeze (56%). Similarly, Ciftci et al found cough and respiratory distress in 77% and wheeze in 63% as common symptom.[14]

In our study chest X-ray were normal in 32% patients which is similar to the findings of Aydogan et al with 34.5% and Tann et al with 26.6% patients having normal chest X-ray.[10,15]

In the present study, in 47.83% patients foreign body was found in left bronchus, 39.13% in the right bronchus and 13.04% in trachea which is similar to findings by Safari et al. and Chung et al.[16,17]

In our study most common type of aspirated foreign body was organic (73.91%) with peanuts (47.82%) being the most common type because in our region use of peanut by people is common. This is in line with the results obtained by Fazal et al and Muhammad et al.[18,19]

In our study 50% patients were treated in first 24 hours, 20% between 24-72 hours and 30% in >72 hours which is similar to study by Tan et al.[15]

The positive bronchoscopy rate in our study was 92% which is much higher than in the studies of Black et al and Tomaske et al who reported positive bronchosccopy rate of 85% and 78.2%.[3,20]

The overall morbidity and mortality in our study was 4.35% and 2.17% respectively. Similarly in a study by Kaur et al and Fidkowski et al who observed a mortality of 2% and 0.42%.[21,22]

## CONCLUSION

Inhaled foreign bodies are one of the common surgical emergencies in ENT. Their diagnosis requires a high degree of suspicion on part of treating surgeon. History and clinical examination should be more relied upon as diagnostic tool than radiological findings. A delay in the presentation, diagnosis and treatment poses more problem both to the patient and surgeon thus increasing the morbidity and mortality.

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