Management of Tracheobronchial Foreign Bodies: A Retrospective and Prospective Study

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Abstract (1) To study the presenting complaints or complaints suggestive of foreign bodies in the tracheobronchial tract. (2) To study the clinical findings. (3) To study the correlation between clinical and radiological findings. (4) To study different types of foreign bodies. (5) To study the complications caused by foreign bodies. A total of 115 patients presenting with foreign body aspiration in the tracheobronchial tract were included in the study. Patient characteristics, history, clinical, radiographic and bronchoscopic findings were noted. Foreign bodies in trachea and bronchus were removed by rigid bronchoscopy under general anaesthesia. Jackson rigid bronchoscope with a fibre optic light source and venturi technique anaesthesia was used. In the present study, foreign body aspiration was found to be maximum in the 1–3 year old age group. The average time lapse between aspiration of symptoms and presentation was found to be 1–3 days. Positive history was given in only 68% cases. Cough and breathlessness were the most common presenting symptoms. The commonest clinical signs were decreased chest movement and air entry on the affected side. Collapse of the affected side was the most common radiological finding. The commonest site of impaction was the right main bronchus. Majority of the foreign bodies were vegetative, peanut being the most common. The commonest complication following foreign body aspiration was atelectasis of the affected lung. Successful removal of foreign bodies was possible in all the patients. In paediatric respiratory compromise, the presence of unilateral diminished breath

sounds, a pathological chest X-ray and a clinical triad of cough, choking and wheezing, is a powerful indicator of tracheobronchial foreign body aspiration. Since no single or combined variables can predict foreign body aspiration with full certainty, bronchoscopic exploration must be performed if tracheobronchial foreign body aspiration is suspected.

Keywords Foreign body · Tracheobronchial aspiration · Rigid bronchoscopy

Introduction

Foreign bodies in ear, nose and throat are mainly encountered in paediatric population, as children seem inherently compelled to place loose objects in their mouth or nasal orifices. Often this leads to swallowing or aspiration of foreign bodies. A foreign body in the respiratory tract is a surgical emergency and can prove fatal. The problem becomes complicated because of unavailability of correct or complete history. Such mishaps may occur in the absence of parents or without their knowledge and neither the patients nor the parents are able to provide the exact history.

So it becomes necessary on the part of attending surgeon, to deal with such cases with a high index of suspicion, with the best of his clinical knowledge in time or the patients may go out of hands because of severe respiratory distress or other fatal complications.

This study is planned to assess the problem of aspirated foreign bodies in more details especially with reference to symptoms, signs, radiological findings, complications, the treatment and outcome of service rendered to these patients.

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Fig. 1 Plain chest radiograph showing collapse of the left lung with mediastinal shift to the left with compensatory emphysema on the right side

Fig. 2 Plain chest radiograph showing obstructive emphysema on the right side with mediastinal shift to the left

Materials and Methods

This hospital based retrospective and prospective study was carried out in the Department of Otolaryngology, Government Medical College and Hospital, Nagpur. In this study, records of the patients admitted and treated for foreign bodies in the tracheobronchial tree were scrutinized from 1/9/2001 to 31/8/2006 and a prospective study continued till 31/8/2008. A total of 115 patients were evaluated in our study.

Fig. 3 Plain chest radiograph showing complete collapse of the left lung due to total obstruction of left main bronchus with compensatory emphysema on the right side

The aims of the study were—

1. To study the presenting complaints or complaints suggestive of suspected foreign body aspiration.
2. To study the clinical findings.
3. To study the correlation between clinical findings and radiological findings.
4. To study the different types of foreign bodies.
5. To study the complications caused by the foreign bodies.

All patients who underwent bronchoscopies for removal of foreign bodies in the tracheobronchial airway in the period from September 2001 to August 2006 and all cases presenting with the history or suspected history of foreign body aspiration were included in the study. Patients with foreign bodies in the post-cricoid region or oesophagus and those with negative bronchoscopies were excluded from the study.

Foreign bodies in Trachea and Bronchus were removed by rigid bronchoscopy under general anesthesia. Jackson rigid bronchoscope with fibre optic light source with Venturi technique anesthesia was used for bronchoscopy. After foreign body removal the bronchoscope was reintroduced to inspect the area involved, to remove the inspissated mucus secretions and remnant of foreign body, if any.

Results

The present study includes 115 patients of foreign bodies in the tracheo-bronchial tree. Foreign bodies were most commonly seen in the 1–3 year age group. A total of 52 cases accounting for 45.2% were from this age group.

Fig. 4 Plain chest radiograph showing a radio-opaque foreign body (stone) in the left main bronchus with obstructive emphysema on the left side

Males were more commonly affected as compared to females with a Male:Female ratio of 2.7:1. The time lapse between aspiration of foreign body or onset of suspected symptoms and reaching the hospital was between 1 and 3 days in 46.5%. Almost 67% of the patients reached the hospital within the first 72 h (20.5% within 24 h and another 46.5% by the next 48 h). Out of the 115 cases, only 68% gave a positive history of foreign body aspiration.

Cough and breathlessness were the commonest symptoms accounting for 90% of the cases. The most common signs (Table 1) to be elicited were decreased chest wall movements on the affected side and decreased air entry seen in 78.4% of the cases. In our study, we had one rare case presenting with spontaneous surgical emphysema and

Fig. 5 Spontaneous surgical emphysema following foreign body aspiration

Fig. 6 CT scan of the thorax showing a foreign body obstructing the right main bronchus with pneumomediastinum and surgical emphysema of the chest wall

pneumo-mediastinum without any history of foreign body aspiration.

The commonest positive radiological finding (Table 2) was collapse of the affected lung seen in 35% of the cases (Figs. 1, 2, 3). Mediastinal shift was noted in 41% of the patients. Radio-opaque F.B. were visualized in three cases (Fig. 4). Concerning the site of impaction of foreign body, 56% of the patients aspirated the foreign body into the right main bronchus, 31% of the cases in the left main bronchus and tracheal foreign bodies comprised 13% of the cases. CT Scan was done in one case of spontaneous surgical emphysema, without history of foreign body aspiration (Fig. 5). CT Thorax showed a Foreign body in the right main bronchus (Fig. 6). After the successful removal of the foreign body by bronchoscopy, there was spontaneous resolution of pneumomediastinum as well as surgical emphysema.

Table 1 Clinical signs

Sign	No. of cases	%
Tachypnoea	79	68.6
Cyanosis	1	00.8
Irritability	52	45.2
Decreased chest wall movement	91	78.4
Chest indrawing	37	32.1
Dull percussion note	73	62.9
Decreased air entry on affected side	91	78.4
Ronchi	40	34.4
Crepts	49	42.2
Tracheal shift	47	40.8
Tracheal thud	14	12.9
Surgical emphysema	1	00.8

Table 2 Radiological findings

Radiological finding	No. of cases	%
Normal X-ray	41	35.6
Collapse of affected lung	40	34.7
Consolidation of affected lung	4	03.4
Collapse + consolidation	18	15.6
Obstructive emphysema	11	09.5
Mediastinal shift	47	40.8
Radio-opaque foreign body seen	3	02.6
Surgical emphysema	1	00.8

Vegetative foreign bodies accounted for 84.7% of the cases with nuts and seeds making up the majority. Peanut was the commonest vegetative foreign body (48.2%). Plastic whistle was the commonest non vegetative foreign body aspirated accounting for 10.3% of the total cases.

Atelectasis of the affected lung was the commonest complication following foreign body aspiration in our study comprising 34.7% of our cases. Two patients required tracheostomy in the intra-operative period for the removal of large foreign bodies. Two patients required tracheostomy in the post-operative for ventilatory support.

Discussion

Aspiration of foreign body is a potentially life threatening problem. Before the introduction of bronchoscopy, it was associated with a high mortality and morbidity. But, with the advent of bronchoscopy, this has reduced drastically.

The commonest age group of presentation was 1–3 years of age (45.2% cases), followed by 3–7 years (26.9% cases). Our youngest patient was 5 months old and oldest was 62 years old.

Parameshwaran [1] reported that a majority of children affected were between 6 months and 3 years. Sreenath and Mahendralkar [2] reported in their 3 year study that the most common age group was 9 month to 2 years. Their youngest patient was of 9 months. Kaur et al. [3] showed that the most common age group was 1–3 years (60% of cases) with their youngest patient was 4 month old. Lone and Lateef [4] reported maximum incidence in the 0–4 years in 52% of cases. Muhammad Asif et al. [5] reported that the 0–5 year age group was most commonly involved (78% of cases). The reason why children are more commonly affected with foreign body inhalation is because of their habit of inadvertently placing objects in the mouth, inadequately developed protective reflexes and incomplete dentition.

Most of the cases of foreign body aspiration can be diagnosed easily if history of foreign body inhalation is

available, but in some patients, the diagnosis is uncertain in the absence of history of aspiration. In this study a negative history was present in 36(32%) cases. Parmeshwaran [1] in his study reported, 52% of cases with a negative history of aspiration.

Out of 115 cases, 85 were males and 30 were females with a Male:Female ratio of 2.7:1. Rothmann and Boeckman [6], Hilou [7], Sreenath [2] also reported that males were more affected than females.

Out of the 115 cases, 97(84%) cases were admitted with respiratory distress of varying degree depending on type, size and site of foreign body. Cough was seen in 111 (95%) cases and noisy breathing reported in 49 (42%) cases.

Kaur [3] reported respiratory distress (80%) and cough (92%) as the commonest presenting symptoms in his study. Kirn et al. [8] reported cough in 50% and wheezing in 57% of patients. Sreenath et al. [2] reported wheeze as the commonest presentation.

If the foreign body is radio-opaque, diagnosis is obvious on chest X-ray. But, a radiolucent foreign body with the absence of history of aspiration becomes a great diagnostic dilemma requiring high index of suspicion. In our study, the majority of the foreign bodies were radiolucent. A radio-opaque foreign body was found in only three cases (Fig. 4). Radiological findings in the chest X-ray were seen in the form of collapse (40 cases), collapse with consolidation (18 cases), consolidation (4 cases) and obstructive emphysema (11 cases).

Kaur et al. [3] reported collapse as the most common finding which coincided with the present study. Sreenath et al. [2] reported obstructive emphysema and consolidation as the most common radiological change. Kirn et al. [8] also reported obstructive emphysema as the most common complication.

In our study, vegetative foreign bodies were the commonest type of foreign body aspirated (84.7%). Only 15.3% foreign bodies were inorganic. Ground nut was the most common foreign body amongst the vegetative foreign body. The second most common was Custard apple seed. The most common Non vegetative foreign body seen was whistle (plastic) followed by plastic pen parts.

Chaturvedi [9], Swanson et al. [10], Black et al. [11], Rothmann and Bockmann [6] and Sreenath [2] also reported groundnut as the commonest foreign body in the bronchus.

In the present study we have reported one patient who presented with pneumomediastinum and subcutaneous emphysema due to sudden and complete obstruction of the bronchus. On bronchoscopy, a peanut was found impacted in the right main bronchus and after it was removed, the patient recovered completely. This unusual presentation in the absence of a history of foreign body aspiration was also reported in another study by Ramadan et al. [12].

The commonest complication following foreign body aspiration in our study was atelectasis of the affected lung comprising 34.7% of the cases followed by pneumonia seen in 19% of the cases.

The mortality rate in this study was 4.3%. 3 patients died prior to bronchoscopic evaluation. Two patients went into cardiac arrest intra-operatively and expired 2 days even after successful bronchoscopic removal of the foreign bodies.

Rothmann and Boeckman [6] studied 225 cases and found obstructive emphysema in 60% cases, atelectasis in 12% cases, pneumonia in 8% cases and mediastinal emphysema in 1.7% cases. Reilly et al. [13] studied 507 foreign bodies with respiratory systems and reported that 30 children had respiratory arrest. Out of these, the Heimlich maneuver was employed successfully in two children who recovered without sequelae. Loss of consciousness but with full functional recovery following bronchoscopic foreign body removal occurred in additional 22 children. Three children survived in a persistent vegetative state. Three children died prior to emergency room evaluation.

Conclusion

In a situation with paediatric respiratory compromise, the presence of unilateral diminished breath sounds, a pathological chest X-ray and a clinical triad of acute coughing/choking/wheezing, necessitates a bronchoscopic exploration to exclude an inhaled tracheobronchial foreign body, even if such history is absent. Whenever a tracheobronchial foreign body is suspected, even in presence of doubtful history of aspiration, an explorative bronchoscopy should be undertaken as the morbidity of explorative bronchoscopy is definitely lower than the morbidity of undiagnosed or missed tracheobronchial foreign body with delayed removal.

Conflict of Interest None.

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