

Foreign body inhalation in children: A mixed bag of experiences over two years in a tertiary care center of Eastern India

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ABSTRACT

Background: Foreign body aspiration (FBA) is a common medical emergency in childhood. It may have serious and lethal outcomes if not managed promptly. The clinician must suspect FBA on the grounds of history, even if clinical and radiological findings are not supportive. **Objective:** The objective of this study was to study the clinicoepidemiological profile of FBA in children. **Materials and Methods:** This hospital-based retrospective study was carried out in the Department of Pediatric Surgery between October 2017 and November 2019. A total of 15 cases of FBA reported in children were analyzed. All these cases presented in a medical emergency. History taking and clinical examination were followed by radiological evaluation and bronchoscopy in all the cases. **Results:** We reported 15 cases of FBA in children in our setting for 2 years. There were 11 boys (73%) and four girls (27%). Most of the cases reported within 3 days of aspiration, but the time of presentation was as long as 6 months. Rigid bronchoscopy was performed in all cases, and Magill forceps were used in two cases. Spontaneous expulsion of the FB occurred in two cases. All cases were subjected to check bronchoscopy. **Conclusion:** The age group <3 years have the highest risk for FBA. Bronchoscopy is a skilled procedure and requires the utmost care to avoid lethal complications. The clinician must not get hesitant in doing repeat bronchoscopy in multiple settings to ensure successful retrieval of the FB.

Key words: Choking, Foreign body aspiration, Pediatric emergency, Rigid bronchoscopy

Foreign body aspiration (FBA) is defined as asphyxia, suffocation, or inhalation of items of food such as bone and seed, and non-food such as toys, into the respiratory tract [1]. FBA is a frequent pediatric medical emergency, especially among children aged <3 years of age [2]. This is mainly attributed to the absence of molar teeth, which reduces their ability to properly chew food items such as peanuts or melon seeds [1,3,4]. Metallic and plastic FBs have also been reported but in lesser percentage [5]. A higher incidence has been reported in boys [6,7].

A history of aspiration is very important for diagnosis, as sometimes there are no abnormalities in the physical examination of the patient [8]. It remains a diagnostic challenge for a primary physician if the history of respiratory symptoms is incomplete [9]. History of choking in children is suggestive of FBA. The classical clinical presentation may be found in <40% of the cases [2,10]. Sudden aspiration of a FB may result in acute respiratory distress or even death. The main symptoms associated with aspiration are suffocation, cough, stupor, excessive sputum production, cyanosis, or difficulty in breathing. These symptoms develop immediately after aspiration [5,11]. It may also lead to pulmonary infection mimicking croup, pneumonia, and asthma [6].

The patient's symptoms, physical examination findings, and clinical history were observed to have high sensitivity, but

radiological findings had the highest specificity [11]. Gibbon *et al.* reported computed tomography (CT) to be 100% sensitive and 98% specific with excellent interobserver reliability ($\kappa=0.88$) [12]. Most of the FBs are expelled spontaneously, but a significant percentage impacts the upper aerodigestive tract [3]. Delayed treatment of FBA is related to a higher occurrence of complication with longer duration of surgery and hospital stay [13]. Rigid bronchoscopy is the gold standard for the management of FB bronchus. The present study was conducted to assess the clinicoepidemiological profile of FBA in children.

MATERIALS AND METHODS

This retrospective cross-sectional study was carried out from October 2017 to November 2019. We obtained the hospital records of all the cases admitted with the history of FBA. Declaration of Helsinki had been followed throughout the research work. All the cases of FBA in tracheobronchial tree were included in the study. A total of six cases with FBA in gastrointestinal tract were excluded from the study. We analyzed records of cases that underwent bronchoscopy for evaluation of FBA. Neck and chest X-ray (anterior-posterior and lateral) were taken in all cases before bronchoscopy. Contrast CT was

done in long-standing cases. All the children with suspected FBA underwent bronchoscopy regardless of the X-ray finding. Consent was taken from the parents before the procedure. Under general anesthesia, bronchoscope was introduced and with the help of crocodile forceps FB was held and the entire scope with the forceps was then removed to retrieve the FB.

We used a predesigned pro forma to record age, sex, history of FBA, symptoms and its duration, radiological findings, management, complications, and outcome. X-ray records and photographs of FB were acquired from the digital gallery of the department. We entered and analyzed data using Microsoft Excel office 365. Categorical data were presented as a percentage table. Continuous data were categorized into groups for presentation and charts were plotted as required.

RESULTS

Of 15 cases reported, 11 were male (73%) and four were female (27%). The age-wise distribution of children with FBs in the airway is depicted in Table 1. The most common age group was between 1 and 3 years representing 54% of cases. The most common duration of the presentation after aspiration of a FB was within 3 days. Only one case presented within 24 h of aspiration (Table 2), while two cases reported after 5 months.

In 12 cases (80%), we found that inorganic materials were aspirated while in the remaining three, there were organic materials. We reported black Bengal gram, mucus plugs, and peanut as organic matter and spring, earring, pen cover, whistle, metal screw, iron nail, nose pin, charger pin, brush head, and

ice cream spoon as inorganic materials (Fig. 1). The child who aspirated peanut presented with choking and respiratory distress. In two cases, patients had a history of choking just after intake of the FB, but it got relieved after bouts of cough. We observed the right bronchus as the most common (60%) site of the aspirated FB followed by the left bronchus in 27% of cases. The intervention done has been tabulated in Table 3. Chest X-ray findings of FBA cases are presented in Fig. 2.

DISCUSSION

Inhalation of the FB among children is a frequently observed event in a tertiary center. Delay in diagnosis has been observed when either parents ignore the symptoms or primary physicians face diagnostic challenge due to lack of knowledge of exact history or inconclusive radiological findings. We are reporting our experience with fifteen cases of FBA from the past 2 years. Male preponderance was observed in various series of FBA [13,14]. In a big series of 603 cases with FBA over the 10 years, 67% were male and 33% were female [15]. These are in accordance with our study, where 73% of males and 27% of females were observed.

The majority of the patients (54%) were under the age of 3 years. These findings were in accordance with a study done by Yadav *et al.*, where the most common age was between 1 and 3 years (41.6%). Similar findings were reported by Ciftci *et al.* and Huankang *et al.* [15,16]. Most of the children (53%) had duration of symptom between 1 and 3 days (42.4%). Only one case reported within 24 h, while two cases reported beyond 4 weeks. These were in accordance with the findings in the study by Yadav *et al.*, where only 3% of children reported within 6 h with symptoms while 15.2% reported after 1 week [6].

In the present study, around 71% of the items aspirated were observed to be inorganic in nature. This is in contrast to other studies, where 8–38% inorganic items were aspirated [14,16,17]. Wang and Che reported a case with swallowed plastic whistle which got incarcerated in the bronchus and was diagnosed after 14 years [18]. In the present study, a case of plastic FBA who reported within 3 days was observed.

Peanut was the most common FB aspirated in most of the series [14,19,20]. In the present study, the case with peanut aspiration presented within 24 h with the history of choking. Those presented with 3 days were having a history of cough and respiratory distress mostly. In two cases which presented after 5 months, in the first case, a 10-year-old boy has aspirated screw but kept neglected by his parent as he does not have any

Table 1: Age-wise distribution of children with foreign bodies (n=15)

Age group (years)	Number	Percentage
<1	2	13
1–3	8	54
4–6	2	13
>10	3	20

Table 2: Duration of presentation in children with foreign bodies (n=15)

Duration	Number	Percentage
<24 h	1	7
1–3 days	8	53
3–7 days	4	27
>4 weeks	2	13



Figure 1: Retrieved foreign bodies. (a) Screw; (b) earring; (c) brush head; (d) charger pin (e) noise pin

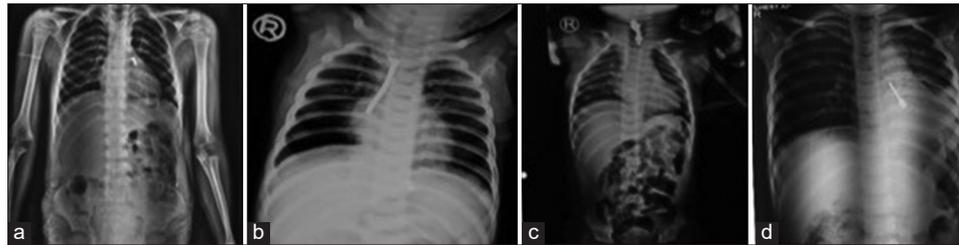


Figure 2: X-ray chest of foreign body aspiration cases; (a) screw in the left bronchus; (b) nail in the right bronchus; (c) earring in laryngopharynx; (d) charger pin in the left bronchus

Table 3: Intervention for foreign bodies of the airway (n=14)

Intervention	Number	Percentage
Rigid bronchoscopy	9	65
Spontaneous expulsion	2	14
Magill forceps	2	14
Spontaneous expulsion after bronchoscopy	1	7

One case left against medical advice before any intervention done

symptoms. Meanwhile, with each seasonal episode of common cold and cough, the parent became apprehensive about the aspirated FB. In the second case, a 14-year-old girl aspirated a nose pin, but their parents were not aware of this. The clinician advised X-ray chest after recurrent episodes of pneumonia and incidentally found an aspirated FB in the left bronchus.

In our study, one case was admitted in pediatric medicine with initial diagnosis of pneumonia with lung collapse. When the child did not improve, CT was advised and FB was suspected in the right bronchus. The child was referred to us for bronchoscopy. A mucus plug was found in the right bronchus and was removed. The child recovered thereafter. A similar case was reported by Devkota *et al.*, [21] where 1-year child initially diagnosed with pneumonia but later when child deteriorated, CT was advised and it showed a soft-tissue density shadow blocking the right main bronchus probably due to mucus plug. Children cannot cough out the sputum completely. When there is an infection, the glands on the respiratory passage secrete large amounts of mucus and debris, which lead to blockage of respiratory bronchioles and bronchus. This can later develop the symptoms similar to the FB obstruction [21].

Determination of the site of obstruction is the key to the management of FBA. The location of FB depends on its characteristics and also on the position of child at the time of aspiration [3]. In a series of 210 cases over the 8 years, Skoulakis *et al.* [4] reported 60% of FB in the right main bronchus which is similar to our observation and 33% in the left main bronchus. Huankang *et al.* [16] reported relatively equal distribution of FB in the right and left bronchus, while Safari and Manesh [20] observed only 35% of FB in the right bronchus.

Bronchoscopy is essential if a FB is suspected. It is used as a diagnostic as well as a therapeutic tool. We did a rigid bronchoscopy in all cases. Magill forceps were used in two cases. We reported spontaneous expulsion of the FB in three cases. In one case, during bronchoscopy, the FB got dislodged and could not be retrieved. Spontaneous expulsion occurred within a week

after discharge while coughing. Spontaneous expulsion occurred while doing cannulation in two cases due to excessive crying followed by a vigorous cough. Check bronchoscopy was done in both cases. In a series of 603 cases, Ciftci *et al.* reported 5 (0.8%) deaths due to cardiopulmonary arrest, two immediately after FBA, and cardiac arrest and worsening respiratory tract infection after bronchoscopy [15]. We also reported one death after a rigid bronchoscopy on post-operative day zero. The death was due to respiratory arrest.

The limitation of our study was its retrospective design and a smaller number of samples due to a shorter duration. The subgroup comparison was not possible, and thus, results cannot be generalized.

CONCLUSION

The risk of FBA is highest for the age group <3 years. Bronchoscopy is a skilled procedure and done with great care to avoid lethal complications. FBA is a devastating event for parents as well as treating clinicians. It is an important and preventable cause of mortality and morbidity in children. It needs family and community vigilance for the high-risk age group.

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