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A retrospective study of flexible bronchoscopic retrieval of airway foreign bodies in adults

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Abstract

Unlike in children, foreign body aspiration in adults is an uncommon occurrence. The clinical presentation is often nonspecific, with a myriad of symptoms and radiological abnormalities. These cases can mimic chronic lung conditions like asthma and chronic obstructive pulmonary disease, thereby delaying definitive diagnosis and timely interventions.

We conducted a retrospective analysis of the bronchoscopy suite database (January 2022 to December 2025) to identify cases subjected to flexible bronchoscopy for suspicion of a foreign body. Data on demographics, clinical symptoms, radiological findings, type of foreign body, retrieval methods, and procedure-related complications were retrieved and analyzed.

During the study period, a total of 1679 flexible bronchoscopies were performed. Of these, 12 (0.71%) were done for suspected foreign body aspiration. A foreign body was identified in 10 cases (83.33%), and in eight cases (80%), the foreign body was successfully retrieved using a flexible bronchoscope.

The mean age of the study population was 48.38 ± 20.23 years, with a female preponderance (62.5%). The most common radiological presentation was atelectasis, and direct visualization of foreign bodies was found in five cases (62.5%). Organic foreign bodies were commonly identified (87.5% of cases); among them, betel nut was the most common foreign body. Grasping forceps and Dormia baskets were the most commonly used instruments, with no major complications.

Foreign body aspiration in adults is a rare clinical entity, and a high index of suspicion is required to identify such cases. Flexible bronchoscopy is the modality of choice for diagnosis and retrieval of foreign bodies with a high success rate and minimal complications.

Key words: foreign body, adults, retrospective, retrieval, flexible bronchoscopy.

Introduction

Foreign body aspiration in adults is an uncommon clinical condition that poses significant diagnostic and therapeutic challenges. Unlike in children, where aspiration events are usually witnessed and symptoms are acute, adult patients frequently present with vague respiratory complaints, resulting in delayed diagnosis. Common presentations include persistent cough, wheezing, hemoptysis, recurrent pneumonia, lobar collapse, or non-resolving pulmonary infiltrates, and a clear history of aspiration may be absent or forgotten [1-3].

In most instances, chest radiographs are unable to visualise foreign bodies due to their radiolucency. In such cases, a chest radiograph may be either normal or demonstrate indirect signs of airway obstruction, such as atelectasis, consolidation, and, in long-standing cases, bronchiectasis [3,4]. Due to such unusual radiological presentations, definitive diagnosis may be considerably delayed. Contrast-enhanced computed tomography (CECT) scans of the thorax have high sensitivity for the diagnosis of airway foreign bodies when chest radiographs are either normal or only show indirect signs.

Flexible bronchoscopy has increasingly been used as the initial diagnostic and therapeutic modality in adults suspected of airway foreign bodies. It has several advantages over rigid bronchoscopy, such as wide availability, ability to be performed under local anaesthesia, ability to screen distal airways, and favourable safety profile. Flexible bronchoscopy demonstrated a high success rate for foreign body removal in adults with minimal procedure-related complications [4-8]. However, certain factors, such as delayed presentation, impacted foreign bodies, extensive granulation tissue, or prior failed attempts, make the retrieval of the foreign body difficult using a flexible bronchoscope and warrant rigid bronchoscopy or surgical intervention.

Due to heterogeneity in the presentation, here we report our clinical experience in the diagnosis and management of foreign bodies in adults using a flexible bronchoscope.

Materials and Methods

The present study is a retrospective observational study of all flexible bronchoscopies performed between January 2022 and December 2025 at a tertiary-care centre in western Rajasthan, India. Patients aged 18 years or older who underwent flexible bronchoscopy for suspected airway foreign body aspiration during the study period were identified from the institutional bronchoscopy suite dataset and medical records. Only cases in which a foreign

body was confirmed by bronchoscopic visualisation were included in the study. We excluded patients with incomplete clinical or procedural records.

For each case, demographic information and relevant clinical details were extracted, including presenting symptoms, duration of symptoms before diagnosis, history suggestive of aspiration, and associated comorbidities. Radiological findings from chest radiographs and computed tomography scans performed before bronchoscopy were reviewed, documenting both direct visualization of foreign bodies and indirect features of airway obstruction such as consolidation, atelectasis, or bronchiectasis.

The flexible bronchoscopy (Olympus BF1T150) was performed by faculty members or a pulmonology fellow under faculty supervision. The procedure was performed through the oral route in every case, and under topical anaesthesia (10% lignocaine spray, 2% lignocaine aliquots) with conscious sedation (midazolam/fentanyl).

The location of the foreign body within the tracheobronchial tree and its nature (organic or inorganic) were documented. Retrieval techniques and accessories used—such as grasping forceps, Dormia basket, or electrocautery snare were recorded.

Clinical outcomes such as successful removal of the foreign body, need for conversion to rigid bronchoscopy, and procedure-related complications like bleeding, airway injury, or respiratory deterioration were recorded. Patients with impacted foreign bodies, failed flexible bronchoscopic attempts, or those requiring secure airway control underwent rigid bronchoscopy under general anaesthesia.

Results

We conducted a retrospective study to determine the prevalence of adult foreign bodies among the patients who underwent flexible bronchoscopy. The data were retrieved over 3 years between January 2022 and December 2025 from the bronchoscopy suite of the Department of Pulmonology at a tertiary care teaching hospital in western Rajasthan. During this period, a total of 1679 flexible bronchoscopies were performed. Out of these 1679 bronchoscopies, 12 were done for the suspicion of an airway foreign body (0.71%). From these 12 cases, a foreign body was successfully located in 10 patients (83.33%), and in the other 2, no visible foreign body was found. We were able to retrieve foreign bodies in eight (80%) of these cases using flexible bronchoscopy. Because of the extensive granulation tissue and deeply impacted foreign body in two cases, attempts at retrieval using flexible bronchoscopy were unsuccessful,

and they were subsequently subjected to rigid bronchoscopic retrieval under general anaesthesia. We excluded these two patients from further analysis.

Patient's demographic details, clinical symptoms, radiologic findings, type of foreign body, retrieval methods, and complications are summarised in Table 1. During the study period, the prevalence of airway foreign bodies at the centre was 0.60%. The mean age of these patients was 48.38 ± 20.23 years, with the majority being female (62.5%). The patients most commonly presented with cough (87.5%), followed by dyspnea (50%), expectoration (50%), fever (25%), and chest pain (12.5%). Abnormal radiological findings were reported in six patients (75%), the most common being consolidation with atelectasis (37.5%). Chest radiograph failed to detect any abnormality in two (25%) patients. Contrast-enhanced computed tomography (CECT) of the thorax was performed in all patients, with 62.5% of patients showing a visible foreign body. Apart from a visible foreign body, other abnormalities included consolidation (50%), airway wall thickening (37.5%), atelectasis (37.5%), and bronchiectasis (25%). All the foreign bodies were lodged in the right lung, and the most common location was the right bronchus intermedius (50%), followed by the right main bronchus (25%), right middle lobe bronchus (12.5%), and right lower lobe bronchus (12.5%). No foreign body was found on the left side of the tracheobronchial tree.

Of all the foreign bodies extracted, 7 (87.5%) were organic, except for one (12.5%) inorganic object. The most common foreign body was betel nut in four patients (50%), followed by caper berry, sapota seed, and a piece of coconut. Flexible bronchoscopy was performed orally in all the patients (Figure 1). Extraction tools employed for the retrieval of foreign bodies were grasping forceps (rat-toothed forceps, alligator forceps), Dormia basket, and an electrocautery snare. Grasping forceps were used in all patients, followed by a Dormia basket in three patients (37.5%) and an electrocautery snare in two patients (25%).

The use of flexible bronchoscopy for foreign body retrieval proved to be safe with minimal immediate complications. Mild mucosal bleeding was reported in 37.5% of patients, which was controlled either spontaneously or by using topical adrenaline (1:10000) in all of them.

Discussion

Foreign body aspiration in adults is a relatively uncommon condition that poses a significant diagnostic and therapeutic challenge. This is attributed to delayed presentation, non-specific symptoms, and normal to near-normal radiological presentation. In contrast to children, foreign bodies in adults account for a small proportion of diagnostic bronchoscopies. In a

retrospective study of 25,998 bronchoscopies performed in adults, Sehgal et al reported the incidence of only 0.25% [4]. Another retrospective study by Jalandra et al reported that out of 7.6% of diagnostic bronchoscopies performed for suspected airway foreign bodies, they were able to visualise a foreign body in only 2.1% of the patients [6]. In our study, the prevalence of foreign bodies in adults was 0.60%.

The clinical presentation of a foreign body in adults is quite variable and non-specific. Some of the patients present with a history of choking or a bout of vigorous coughing immediately after aspiration of a foreign body. However, in the absence of these symptoms, the diagnosis is often delayed, leading to misdiagnosis and complications related to it [3]. In the present study, 62.5% were not able to recall any history of foreign body aspiration. This emphasises further to have a high index of suspicion for timely diagnosis of foreign bodies in adults. In our study, cough was the predominant symptom, followed by dyspnea, expectoration, and fever. One patient (12.5%) underwent a chest radiograph for some other reason and was diagnosed with lobar atelectasis; the patient was asymptomatic.

As per the literature, there are certain risk factors for foreign body aspiration in adults, including head injury, substance abuse, neuromuscular disorders, Parkinson's disease, etc [9-12]. A multicentre retrospective study conducted by Jang G et al reported that 70% of the patients were healthy with no obvious risk factor [13]. The most common foreign body in their study was a tooth, which accounted for nearly 38% of the cases. They described the role of the supine position and the effect of local anaesthesia decreasing the cough reflex as the main risk factor during dental treatment. However, another study by Sehgal et al reported that, except in one case, there was no specific risk factor for foreign body aspiration among the study population [4]. We also encountered a similar finding where all the patients were healthy except one patient (narcotic abuse).

A chest radiograph is the initial diagnostic test for evaluation of foreign bodies in adults. Some of the foreign bodies are radiopaque and are easily identified. In cases of organic foreign bodies, chest radiographs are either normal or reveal signs of atelectasis, consolidation, bronchiectasis, etc. CECT thorax is a more sensitive test than chest radiograph in the detection of foreign bodies and related complications. In our study, CECT thorax was able to detect foreign bodies in five cases (62.5%); among them, four were of organic type. The remaining cases showed parenchymal changes like consolidation, atelectasis, bronchiectasis, narrowing of the airway lumen, etc. Thus, the CECT thorax is a useful diagnostic modality not only to

detect foreign bodies but also the complications of long-term impaction of foreign bodies [14,15].

Sometimes, organic foreign bodies may remain undetected even on a CT scan of the thorax, also leading to delayed diagnosis. In a case series, Kumar et al concluded that segmental bronchiectasis was a crucial radiological clue for the diagnosis, and organic foreign bodies remained undetected even on high-resolution CT scans of the thorax [5]. Bronchoscopy played a pivotal role in such cases for timely diagnosis and management.

Rigid bronchoscopy is the gold standard procedure for the retrieval of foreign bodies in children. However, in adults, flexible bronchoscopy remains the modality of choice because of its several advantages over rigid bronchoscopy, such as wide availability, high success rates, can be performed as a day-care procedure, avoids the need for general anaesthesia, is cost-effective, and has minimal complications associated with it. The overall success rate of the present study was 83.33%. This is as per the literature from around the world and from India, which reported success rates ranging from 60% to more than 90% [4,6,8,12,16]. Fortuitously, we encountered foreign bodies only in the right tracheobronchial tree in all the cases. This is in contrast to the literature, where foreign bodies were reported on both sides, though the right bronchial tree is the most common site due to its wide opening and vertical orientation.

Due to vague and non-specific symptoms, most of the patients seek medical consultation quite late. This delay leads to the development of granulation tissue in up to 85% of patients, making retrieval too difficult to be done through flexible bronchoscopes [3]. The development of granulation tissue is reported to be not significantly associated with the nature and location of the foreign body, and the age of the patient. In our study, among two patients, multiple attempts for the retrieval of the foreign body failed mainly due to extensive granulation tissue, the large size of the foreign body, and vigorous bouts of cough during the attempts. These patients were subjected to rigid bronchoscopic retrieval.

Various tools have been used for the retrieval of foreign bodies, like grasping forceps (rat-toothed or alligator forceps), Dormia basket, and electrocautery snare, alone or in combination. Fragile types of foreign bodies required retrieval using a Dormia basket, whereas others required a combination of all the modalities for retrieval in a piecemeal manner. Kumar T P et al reported the use of a flexible cryoprobe for the retrieval of fragile and organic types of foreign bodies with a good success rate [5].

Various types of foreign bodies in adults, such as tooth, fish or chicken bones, nuts, seeds, beans, food particles, plastic items, dental prostheses, etc., have been reported in the literature

[3,4,8,13]. In our study, betel nut was the most common foreign body, followed by sapota seed, caper berry, a piece of coconut, and a broncholith. These findings suggest that the prevalence of foreign bodies among adults is largely driven by their eating behaviours and local food and traditions. Several studies from different countries or regions reported similar variations in the type of foreign bodies based on region-specific customs and habits [11,16,17]. In the present study, three patients developed mild mucosal bleeding, which was controlled using topical adrenaline. Studies have reported numerous complications, such as airway bleeding, migration of the foreign body, exacerbation of pre-existing pulmonary diseases, transient hypoxemia, and bronchospasm or laryngospasm [4-6].

Conclusions

Foreign body aspiration among adults is relatively uncommon, and an atypical presentation makes the diagnosis more difficult. A high index of suspicion is warranted in patients with recurrent lower respiratory tract infections and abnormal radiological findings. Flexible bronchoscopy can be used for confirmation of the diagnosis as well as for the retrieval of foreign bodies under local anaesthesia with minimal complications. Failed attempts using a flexible bronchoscope, deeply impacted foreign bodies, and extensive granulation tissue require removal using a rigid bronchoscope under general anaesthesia.

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Table 1. Baseline characteristics of patients with foreign bodies.

Parameters (N=8)	Values
Age (Mean $\pm$ SD) (in years)	48.38 $\pm$ 20.23
Sex	
Males, n (%)	3 (37.5)
Females, n (%)	5 (62.5)
Clinical features, n (%)	
No symptoms	1 (12.5)
Dyspnea	4 (50)
Cough	7 (87.5)
Expectoration	4 (50)
Fever	2 (25)
Chest pain	1 (12.5)
History of Foreign body inhalation, n (%)	3 (37.5)
Radiological findings (Chest radiograph), n (%)	
Normal	2 (25)
Consolidation only	2 (25)
Consolidation with atelectasis	3 (37.5)
Bronchiectasis	1 (12.5)
Radiological findings (CECT thorax), alone or in combination, n (%)	
Consolidation	4 (50)
Atelectasis	3 (37.5)
Bronchiectasis	2 (25)
Calcific foci	1 (12.5)
Airway wall thickening	3 (37.5)
Visible foreign body	5 (62.5)
Location of foreign body, n (%)	
Right main bronchus	2 (25)
Right intermediate bronchus	4 (50)
Right middle lobe bronchus	1 (12.5)
Right lower lobe bronchus	1 (12.5)
Left main bronchus	0
Left lower lobe bronchus	0
Type of foreign body, n (%)	
Organic	7 (87.5)
Betel nut	4 (50)
Sapota seed	1 (12.5)
Caper berry	1(12.5)
Piece of coconut	1(12.5)
Inorganic, (Broncholith)	1 (12.5)
Modality used (alone or sequentially), n (%)	
Retrieval basket	3 (37.5)
Grasping forceps (Rat-toothed or alligator forceps)	8 (100)
Electrocautery snare	2 (25)

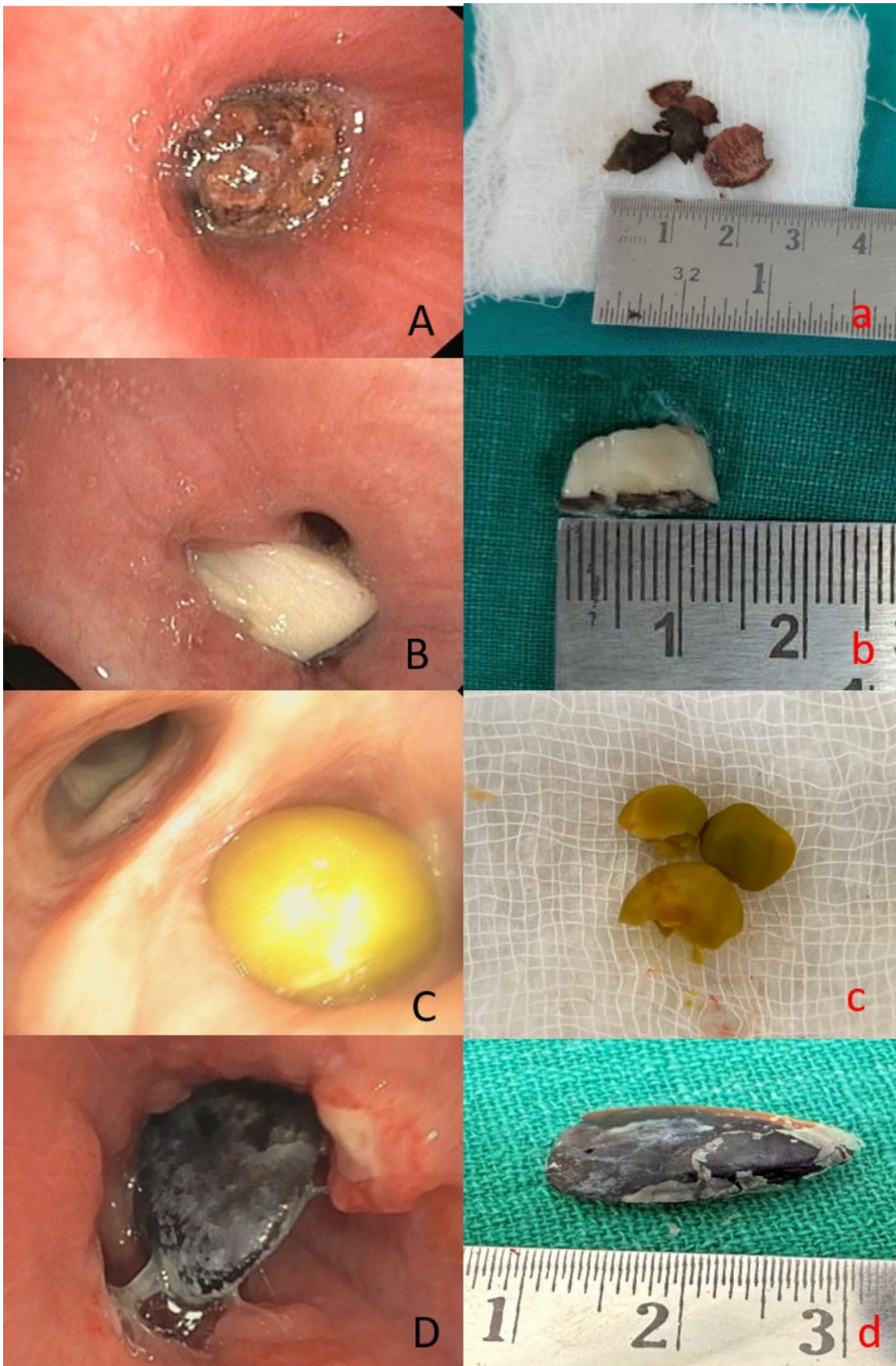


Figure 1. Various types of foreign bodies in adults. Bronchoscopic and ex-vivo appearance: Betel nut (A and a); a piece of coconut (B and b); Caper berry (C and c); Sapota seed (D and d).