

MDCT Imaging of Foreign Body in Adult Bronchus: Case Series of 3 Patients

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Abstract

Background: Foreign body (FB) aspiration refers to the entry and lodgement of a foreign material within the tracheobronchial tree. Foreign body aspiration is more common in children than adults and accounts for 25% of all cases of foreign body aspiration. FB in adults primarily presents with nonspecific chronic or subacute respiratory symptoms, such as cough, dyspnea, hemoptysis, fever, and chest pain, which overlap extensively with other pulmonary diseases. Retained FB's may lead to recurrent pneumonias, bronchiectasis, recurrent hemoptysis, pneumothorax, lung abscesses, pneumomediastinum, or other complications. Multidetector row Computed Tomography (MDCT) provides information regarding the location and characteristics of foreign bodies and aid in diagnosis. Bronchoscopy remains the gold standard for diagnosis and management of FB aspiration. The objective is to discuss the clinical presentation, CT imaging characteristics, bronchoscopic findings and treatment outcomes of foreign body impaction in adult bronchus. To highlight the importance of early suspicion and the need for early imaging and bronchoscopy. **Material and Methods:** The study was conducted at the East Point College of Medical Sciences and Research Centre comprising of three subsequent patients diagnosed with airway foreign body impaction. Patient demographic details, clinical features, examination findings, co-morbidities, smoking status and betel nut chewing habits were obtained. All the three patients were subjected to MDCT. All images were reconstructed at 1mm intervals using a standard reconstruction algorithm into 3D virtual images. Patients were subsequently subjected to Flexible + Rigid Bronchoscopy. The clinical, radiological and bronchoscopic data were analysed. **Results:** CT diagnosed foreign bodies in 2 patients and 1 case the CT features stimulated endobronchial lesion (malignancy). Lungs showed consolidation with areas of break down distal to the bronchus. In all 3 cases the foreign bodies were seen on right side and were organic. **Conclusion:** Foreign body impaction in adults remains an uncommon but important clinical entity that is frequently underdiagnosed because of its nonspecific and variable presentations. MDCT along with virtual bronchoscopy can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis. Bronchoscopy remains the gold standard for both diagnosis and treatment. Early suspicion, timely imaging, and bronchoscopic interventions are crucial to reduce morbidity and prevent long-term pulmonary complications.

Keywords: Foreign body, MDCT, bronchus, bronchoscopy.

Received: 03 July 2026

Revised: 22 July 2026

Accepted: 05 August 2026

Published: 20 August 2026

INTRODUCTION

Foreign body (FB) aspiration refers to the entry and lodgement of a foreign material within the tracheobronchial tree. Foreign body aspiration is more common in children than adults and accounts for 25% of all cases.^[1,2] FB in adults primarily presents with nonspecific chronic or subacute respiratory symptoms, such as cough, dyspnea, hemoptysis, fever, and chest pain, which overlap extensively with other pulmonary diseases.^[3] In adults, the peak incidence occurs in the sixth decade of life. In adults, foreign bodies are usually wedged distally, most commonly in the right lower lobe bronchial tree. When the diagnosis is not established immediately, retained FBs may lead to recurrent pneumonias, bronchiectasis, recurrent hemoptysis, pneumothorax, lung abscesses, pneumomediastinum, or other complications.^[4] Chest radiography and Computed Tomography can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis.^[5] Bronchoscopy remains the gold standard for diagnosis and management of FB aspiration.^[6] The present study discusses

3 consecutive cases of foreign body in bronchus and their imaging features on MDCT.

Case Presentations

Case 1: A 55-year-old female, presented with complaints of non-productive cough and breathlessness since 1 day. On examination air entry was reduced in the right hemithorax. Blood investigations showed mild leukocytosis and patient were started on IV antibiotics along with supplemental oxygen.

CT findings

Soft tissue density mass lesion, homogeneously enhancing (pre contrast HU=35 and post contrast HU= 80) measuring 2.2x 2.5 x

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DOI:
10.21276/amt.2026.v13.i2.964

How to cite this article: Gowdru BP, Ulla SK, Indira N. MDCT Imaging of Foreign Body in Adult Bronchus: Case Series of 3 Patients. Acta Med Int. 2026;13(2):1817-1821.

1.8 cm (CC x TR x AP) noted at the region of right main bronchus, obliterating it. Anteriorly, there is loss of fat plane with posterior branch of right pulmonary artery. Posterolaterally, the lesion is infiltrating azygous vein. Posteriorly, the mass is seen upto prevertebral space. Few necrotic and enhancing lymphnodes noted in lower paratracheal, paraaortic, subcarinal, right hilar and right peribronchial regions. Segmental collapse consolidation with air bronchograms noted in medial and lateral segments of right middle lobe and anterior segment of right lower lobe. Right dome of diaphragm is elevated. Minimal right pleural effusion noted with adjacent subsegmental atelectasis in posterior basal segment of right lower lobe.

CT diagnosis:

1. Intraluminal lesion in right main bronchus with mediastinal lymphadenopathy. Suspicious of malignancy. Suggested bronchoscopy
2. Segmental collapse consolidation in medial and lateral segments of right middle lobe and anterior segment of right lower lobe.
3. Minimal right pleural effusion with adjacent subsegmental atelectasis of posterior basal segment of right lower lobe.



Figure 1: Showing intraluminal lesion in right main bronchus.

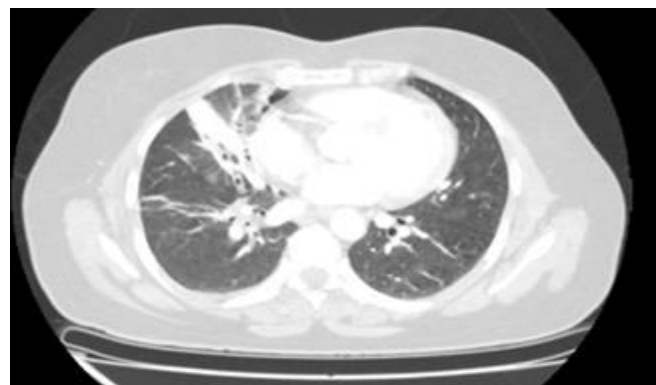


Figure 2: Showing segmental consolidation in medial and lateral segment of middle.

Flexible bronchoscopy revealed an endobronchial mass occluding the right main bronchus, later patient was subjected for rigid bronchoscopy with SNARE and debulking +APC which eventually identified foreign body (beetle nut) in right main bronchus. HPE showed foreign body with surrounding granulation tissue. Patient was treated

symptomatically.

Case 2: A 66 year old female who presented with complaints of non-productive cough since 3 months and hoarseness of voice since 2 weeks. On examination air entry was reduced in the right infrascapular area.

CT findings: Well defined, non-enhancing, soft tissue density ((HU: 45), surrounded by pockets of air seen in right bronchus intermedius with multiple centrilobular nodules with tree-in-bud opacities in medial and lateral segments of right middle lobe; anterior basal and medial basal segments of right lower lobe - infective bronchiolitis. Central bronchiectasis noted involving medial and lateral segmental bronchi of right middle lobe and lower lobe segmental bronchi with inspissated secretions.

CT diagnosis:

1. Intraluminal lesion in in bronchus intermedius –foreign body /mucus impaction. Suggested bronchoscopy
2. Infective bronchiolitis- medial and lateral segments of right middle lobe; anterior basal and medial basal segments of right lower lobe
3. Central bronchiectasis – medial and lateral segmental bronchi of right middle lobe and lower lobe segmental bronchi.

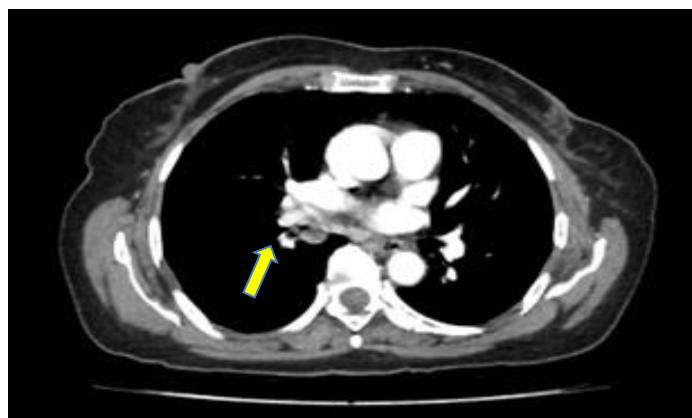


Figure 3: Showing non -enhancing lesion in the right main bronchus.



Figure 4: showing intraluminal lesion in the right bronchus intermedius surrounded by air. Tree in bud opacities are seen in the middle lobe.

Flexible bronchoscopy revealed brownish lesion in the right intermediate bronchus and rigid bronchoscopy detected a vegetative matter (beetle nut) as the foreign body responsible for the above symptoms lodged in the right intermediate bronchus and was successfully removed. Follow up CT showed normal

bronchus with no lung changes. Patient was discharged with oral symptomatic treatment.

Case 3: A 72 year old male who presented with complaints of cough with expectoration on and off since 2 months aggravated over 3 days associated with fever and chills. On RS examination, tubular bronchial breath sounds were heard in the right infra-clavicular area.

CT findings: Well defined, fat density (HU=-39), intraluminal lesion in the right upper lobe bronchus with surrounding inflammation. Dense consolidation with air bronchograms, ground glass opacities, interlobular septal thickening noted in the right upper lobe. Multiple inter communicating air filled areas noted within the consolidation in the apical segment - suggestive of breakdown / cavitation. There is mild bulging of the superior part of major fissure. Patchy areas of consolidation with ground glass opacity and interlobular septal thickening noted in medial and lateral segment of right middle lobe, posterior basal segment of right lower lobe.

Cylindrical bronchiectasis of anterior segmental bronchi of right upper lobe noted.

Centriacinar emphysematous changes noted in apicoposterior segment of left upper lobe, medial and lateral segment of right middle lobe, superior segment of left lower lobe, and basal segments of right lower lobe. Few Panacinar emphysematous areas are noted in the lateral basal segment of right lower lobe.

Few enlarged lymphnodes in right lower paratracheal and right hilar groups.

No pleural effusion

CT diagnosis:

1. Well defined, fat density, intraluminal lesion in the right upper lobe bronchus –Foreign body with surrounding inflammation. Suggested bronchoscopy
2. Consolidation with areas of breakdown - Right upper lobe
3. Enlarged lymph nodes: Right lower paratracheal and right hilar.
4. Mild cylindrical bronchiectasis: Anterior segmental bronchi of right upper lobe.
5. Emphysematous changes -Both lungs.

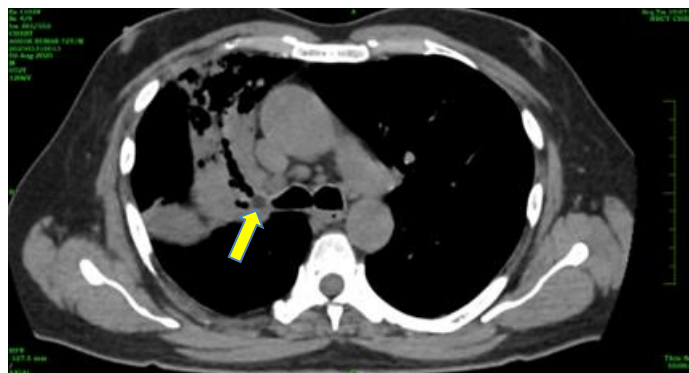


Figure 5: Shows fat density lesion in the right main bronchus. Bronchiectasis of anterior segmental bronchus. Mediastinal lymph nodes.

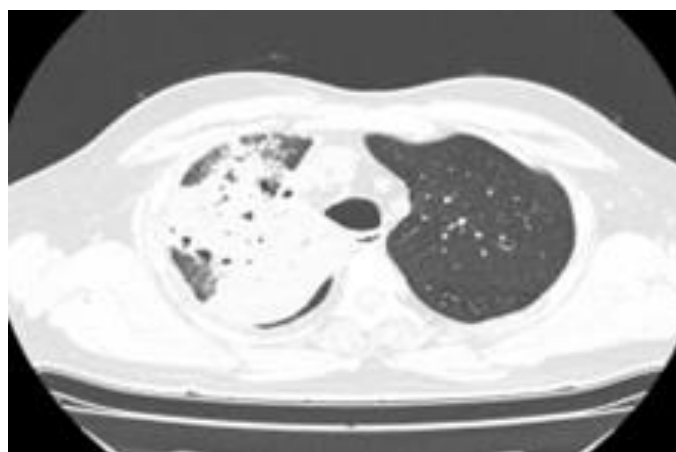


Figure 6: showing consolidation with areas of breakdown. (abscess formation)

Foreign body (ground nut) was successfully removed with 1.1 mm cryoprobe and patient was treated with IV antibiotics and other supportive medications. Repeat bronchoscopy done post foreign body retraction showed inflamed right upper lobe segments with mucoid secretions with lung showing persistent consolidation with breakdown. Patient recovered over a course of 2 months.

Table 1: Summary:

Case	Age	Sex	Clinical features	Duration	Smoking / betel nut chewing status	Ct thorax findings	Bronchoscopy findings	Foreign body
01	55 Y	F	Nonproductive cough, breathlessness	1 day	Chronic Betel nut chewer	Soft tissue enhancing lesion in right main bronchus stimulating neoplasia. Distal pneumonitis with mediastinal lymphadenopathy	Right Main Bronchus Foreign body	Beetle nut
02	66 Y	M	Nonproductive cough and hoarseness of voice	3 months	Chronic Betel nut chewer	Well defined non -enhancing soft tissue density surrounded by pocket of air, mucus plug in right bronchus intermedius. Distal	Right Intermediate Bronchus – Foreign body	Beetle nut
03	72 Y	M	Cough with expectoration, fever with chills	3 days	Reformed Smoker	Fat density lesion in right upper lobe bronchus with distal consolidation with bronchiectasis changes.	Right upper lobe Foreign body with thick mucoid secretions	Ground nut

DISCUSSION

Foreign body aspiration is more common in children than adults

and accounts for 25% of all cases of foreign body aspiration.^[1,2] FB in adults primarily presents with nonspecific chronic or subacute respiratory symptoms, such as cough, dyspnea, hemoptysis, fever, and chest pain, which overlap extensively with other pulmonary diseases.^[3] When the diagnosis is not established immediately, retained FBs may lead to recurrent pneumonias, bronchiectasis, recurrent hemoptysis, pneumothorax, lung abscesses, pneumomediastinum, or other complications.^[4] Chest radiography and Computed Tomography can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis.^[5] Bronchoscopy remains the gold standard for diagnosis and management of FB aspiration.^[6] The present study discusses 3 consecutive cases of foreign body in bronchus and their imaging findings on CT.

One of the major challenges highlighted by these three cases is the difficulty in establishing diagnosis clinically as all 3 cases never gave a history of foreign body aspiration. Adult FB aspiration frequently lacks classic historical features, and many patients may not even remember the aspiration episode. Not all patients demonstrate the classic choking history. Elderly patients may aspirate silently due to impaired laryngeal reflexes and decreased cough efficiency. Clinically, they present with localized wheeze, reduced breath sounds, rhonchi, and crackles, signs of collapse or consolidation. However, clinical findings may also be entirely normal.

Patients are usually seen between 5th and 6th decade and increases as age advances as seen in our cases and less likely to remember the aspiration event.^[7] Most commonly seen in males. Cough is the most common symptom of FB aspiration, occurring in 58–96% of patients as in all cases.^[8] Less common symptoms include wheezing, dyspnea, hemoptysis, chest pain, and recurrent pneumonia. However, normal clinical examination and normal chest radiography will not rule out foreign body aspiration provided if the clinical suspicion remains stronger. Delayed foreign body removal may cause airway obstruction, post obstructive pneumonia, atelectasis, bronchiectasis, hemoptysis, and granulation tissue formation.

Chest radiography and Computed Tomography can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis. Radiographs directly identify the FB in 25% of patients, when the FBs are radio-opaque such as coins, nails, teeth, or dental appliances. Most FBs are organic and radiolucent (such as food) particles, and therefore not directly visible on chest radiograph. Nonetheless, chest radiographs demonstrate indirect, albeit non-specific, findings of atelectasis, hyperinflation, bronchiectasis, or lobar consolidation in the majority of patients. In 14–35% of patients the chest radiograph will be entirely normal.^[9]

MDCT chest is more sensitive for detecting the foreign body and its complications. The majority of FBs become lodged in the right bronchial tree, favoring the bronchus intermedius and the basal segments of the right lower lobe, owing to a more vertical course of the right main stem bronchus.^[10] Most of the foreign bodies are organic materials, such as nuts

and vegetable matter as also in our cases,^[11] and can produce chemical bronchitis and inflammatory mucosal reactions that may mimic endobronchial tumours as in CASE 1 and as reported in study done by Hoan et al.^[12] Additional findings on CT of the chest can include: atelectasis, focal hyperlucency, bronchiectasis, lobar consolidation, tree-in-bud infiltrates, ipsilateral pleural effusion, ipsilateral hilar adenopathy, and thickened bronchial walls.^[13] According to various studies, the sensitivity of MDCT for the detection of bronchial foreign bodies is close to 100%, with specificity between 66.7 and 100%.^[14]

Virtual bronchoscopy has a 100% positive and 93.75% negative predictive value.^[15] Nonresolving pneumonia, direct foreign body visualization and segmental collapse were the most common radiological abnormalities, were also seen in study done by Sehgal IS et al.^[16]

Flexible bronchoscopy is usually diagnostic and therapeutic in adults, while rigid bronchoscopy remains preferred in many centers because it provides superior airway control, ventilation, and retrieval capability.^[17] Early identification and bronchoscopic removal of the foreign body are critical in preventing complications and ensuring favourable patient outcomes. These cases reinforce the need for clinicians to consider foreign body aspiration as an important differential diagnosis in adult patients presenting with atypical or persistent pulmonary symptoms. 2 cases responded immediately after bronchoscopy with normal HRCT chest. However one case presented with persistent consolidation with areas of breakdown which resolved over a month.

CONCLUSION

Foreign body impactions in adults remain an uncommon but important clinical entity that is frequently underdiagnosed because of its nonspecific and variable presentation. All three cases highlight the diverse clinical manifestations ranging from acute symptoms to chronic cough. Organic foreign bodies can also produce intense inflammatory reactions that may mimic endobronchial malignancy. Chest radiography and MDCT along with virtual bronchoscopy can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis. Bronchoscopy remains the gold standard for both diagnosis and treatment. Early suspicion, timely imaging, and bronchoscopic interventions are crucial to reduce morbidity and prevent long-term pulmonary complications.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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