



CASE SERIES ON VARIOUS RADIOLOGICAL IMAGING PRESENTATIONS OF RADIOLUCENT ASPIRATED FOREIGN BODIES IN TRACHEOBRONCHIAL TREE

Radio-Diagnosis

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ABSTRACT

Aspiration of foreign bodies into the tracheobronchial tree are more commonly seen in pediatric age group especially 2 to 5 years of age. Majority of the foreign bodies that get lodged in the trachea-bronchial tree are radiolucent rather than radio-opaque. The increased risk is due to their natural tendency to explore their environment orally, frequent distractions during meals, lack of posterior dentition, and their underdeveloped swallowing reflex [1][2]. Most of the cases come present themselves in the emergency department with acute symptoms while some present with chronic unresolving symptoms such as chronic wheezing, chronic cough and pneumonia. As aspirated foreign bodies are often radiolucent, diagnosis typically relies on indirect radiological imaging findings combined with clinical presentation followed by either rigid or flexible bronchoscopy [3]. In this following 3 case scenarios that presented on emergency basis, we highlight radiological imaging findings pertaining to aspirated radiolucent foreign bodies lodged within the tracheobronchial tree, supported by bronchoscopy images.

KEYWORDS

Radiolucent Aspirated Foreign Bodies (AFB), Low-dose CT, Bronchoscopy.

INTRODUCTION:

Majority of the aspirated foreign bodies lodged within the tracheobronchial tree are radiolucent. Commonly aspirated radiolucent objects in pediatric age group include foods such as peanuts and sunflower seeds, whereas older children tend to aspirate nonorganic objects such as plastic [4][5].

Plain radiograph is neither sensitive nor specific for aspirated radiolucent foreign bodies in majority of the cases [6][7]. Low-dose CT without intravenous (IV) contrast has emerged as an established modality to evaluate aspirated foreign bodies for which radiographs proved insufficient or non-specific to illustrate the foreign body [8][9]. Although bronchoscopy is the gold standard in tackling aspirated foreign bodies, it yields many false negative cases.

Flexible bronchoscopy under general anaesthesia achieves > 90% success in adults, which is preferred for peripheral items, whereas rigid bronchoscopy remains the gold standard for large, sharp, or proximal AFBs [10]. There are cases when rigid bronchoscopy is still preferred since it allows for superior visualization and utilization of larger tools for more effective AFB retrieval [11].

Following are three cases which demonstrate various indirect radiological manifestations:

Case 1:

5 year old child presented to the ER in the evening with history of foreign body aspiration (pencil cap). Developmental history was up to age. Child was afebrile. Clinical examination showed equal air entry bilaterally with occasional crepitations. Per abdomen examination was soft, non-tender and bowel sounds present. Local examination of the nose, mouth and throat were found to be normal. Blood investigations showed leukocytosis and elevated inflammatory markers.

Chest radiograph and CT chest were taken on the same day. Radiograph of the chest was unremarkable. However the child was strongly suspected to have foreign body therefore this was succeeded by plain CT thorax.

Plain CT thorax showed: Significantly attenuated caliber of right upper lobar, anterior and posterior segmental bronchi with wall thickening and luminal irregularity. Mucus plugging / obliteration of apical segmental bronchus was also seen. Faint curvilinear intraluminal structure was seen within the right main bronchus. Subtle centrilobular and subpleural ground glass nodular opacities were predominantly seen in posterior segment of right upper lobe, lateral segment of middle lobe and apicoposterior segment of left upper lobe. Subtle linear atelectatic band also seen in anterior segment of right upper lobe.

Patient was advised bronchoscopy. Foreign body was identified in the right main bronchus. Foreign body removal with flexible

bronchoscope was done under general anesthesia. Foreign body was identified as a pen cap. Patient was stable and improved clinically after the procedure.

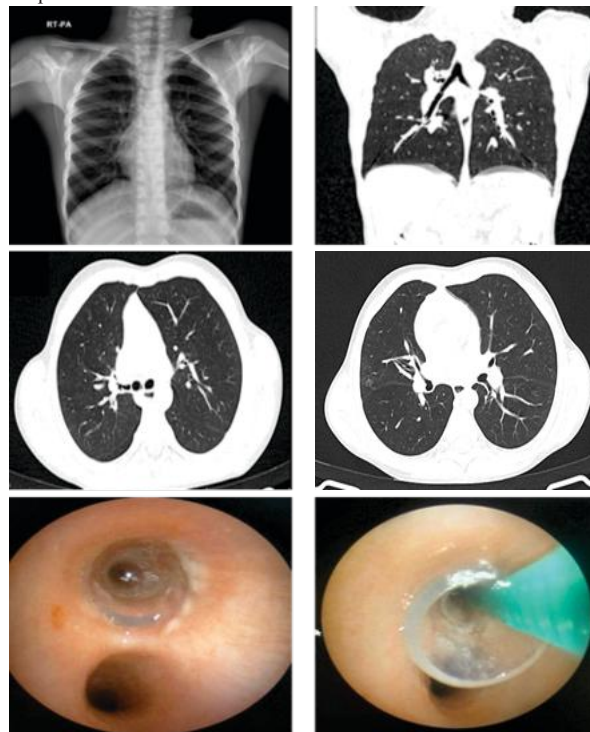


Figure 1: A) Chest radiograph is unremarkable. B and C) Coronal and axial plain CT thorax (lung window) views show significant luminal narrowing of right upper lobar bronchus with wall thickening and irregularity. Faint curvilinear intraluminal structure seen within the right main bronchus D) Subtle centrilobular and subpleural ground glass nodular opacities seen in right upper and middle lobes. E and F) Flexible bronchoscopy images showing plastic pen cap retrieved from the right main bronchus.

Case 2:

2 year old presented to the ER with rapid breathing and acute cough since one day following ingestion of cashew and ground nuts. Similar complaints was present 1 month back also. No history of fever. Developmental milestones were up to age.

Child was afebrile. No pallor, cyanosis, lymphadenopathy or edema. Clinical examination showed reduced air entry on the left side on all areas with subcostal retractions. Per abdomen examination was soft,

non-tender and bowel sounds present. Local examination of nose, mouth and throat was found to be normal. Chest radiograph was taken in another hospital and referred to our hospital for further management. Radiograph of the chest showed left lung hyperinflation with mediastinal shift to the right.

CT chest was taken in our hospital on the same day to localize the foreign body.

Plain CT thorax showed: Hyperinflation of left lung parenchyma seen with narrow bronchovascular markings and significant mediastinal shift to the right, except for mild subsegmental atelectasis in the inferior lingular segment of left upper lobe. Tracheal luminal plugging/ obliteration seen over an area of 9 x 5mm in the left distal main bronchus. Right lung field showed normal parenchymal architecture however hazy attenuation. Discrete small subpleural ground glass nodules were seen in middle and left lower lobes.

Patient was advised bronchoscopy under general anesthesia. Foreign body was identified to be ground nut located in the left distal bronchus. Foreign body however could not be retrieved due to saturation fall and prolonged pick up time therefore referred to higher centre.

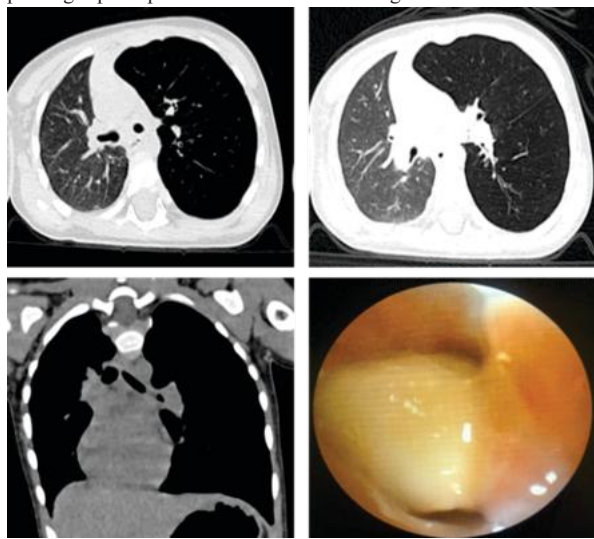


Figure 2: A and B) Axial plain CT thorax (lung window) views show hyperinflation of the left lung with narrowed bronchovascular markings and associated mediastinal shift to the right. Left distal main bronchus plugging seen C) Coronal plain CT thorax (mediastinal window) show plugging of the left distal main bronchus. E) Flexible bronchoscopy images shows a lodged peanut.

Case 3:

2 year old child presented to the ER with wet cough and multiple breath holding spells over 1 week with no diurnal or postural variation. Bluish discoloration of lips and extremities seen during breath holding spells since 1 week lasting for a few seconds. Mother noticed noisy breathing and breathing difficulty since 1 day. Patient was nebulized and given IV steroids in another hospital and then referred to our hospital. History of choking present following cashew nut intake 2 weeks back. No history of fever or altered sensorium. No developmental delay seen.

On examination, patient was lethargic and irritable. No pallor, cyanosis, lymphadenopathy or edema. Chest examination showed equal air entry on both sides with bilateral ronchi and scattered crepitations. Examination of the ear, nose and throat were found to be normal.

Chest radiograph showed mild prominence of the right hilum, likely due to patient rotation. Otherwise unremarkable.

CT findings included:

Right main bronchus appears significantly smaller in caliber. Severe narrowing seen at the proximal bronchus intermedius, distal to which there is abrupt change of caliber where the distal bronchus intermedius appears normal in caliber. No e/o CT radiodense foreign body within the bronchus. Right lobar bronchi are normal in caliber. Mild decrease in attenuation of right lung parenchyma noted – likely air trapping.

Pulmonary consultation was sought for the same and advised bronchoscopy. Bronchoscopy was done under general anesthesia and removed cashew nut from the bronchus intermedius. In due course the child improved clinically and symptomatically.

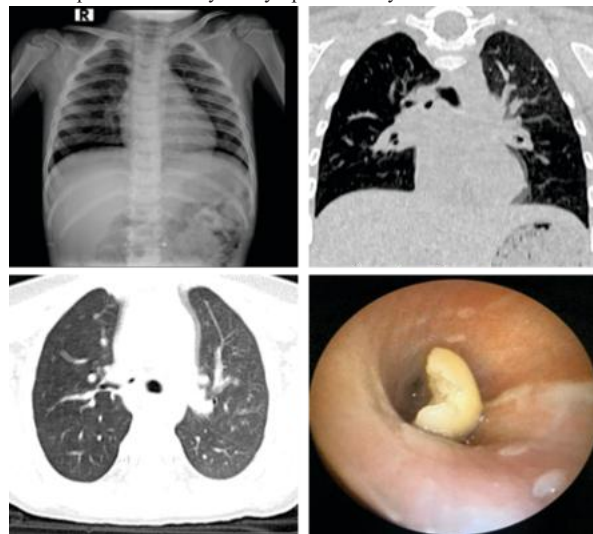


Figure 3: A) Chest radiograph showed prominence of right hilum, probably due to patient rotation, otherwise unremarkable B and C) Plain CT thorax (lung window) coronal and axial views show short segment severe narrowing at the proximal bronchus intermedius distal to which its caliber returns to normal. There is mild reduced attenuation of right lung parenchyma D) Bronchoscopy images show a lodged cashew nut.

CONCLUSIONS:

Diagnosis of foreign body aspiration relies on a thorough and detailed clinical history, along with clinical signs and imaging [4]. Subsegmental collapse and unilateral hyperinflation on radiographs are strong indicators of aspirated foreign bodies. Symptoms may be variable and normal findings may complicate diagnosis.

Current data suggest non-contrast CT has greater sensitivity and specificity for foreign body compared with chest radiograph with 3 recent meta-analyses reporting pooled sensitivities and specificities of 96.6-99% and 92-98.8% [12][13][14]. Reduced-dose CT can be delivered without a clinically significant increase in radiation exposure or hospital expenditure.

Identification of foreign body on imaging is essential prior to bronchoscopy to assess the probability and location of radiolucent foreign bodies through indirect signs such as abrupt bronchial plugging, narrowing, unilateral hyperinflation of lung and subsegmental collapse thereby reducing false negatives. Localization of the foreign body helps in guiding bronchoscopy. Missing foreign bodies can result in fatal outcomes.

Both rigid and flexible bronchoscopy are essential for effective management and timely intervention which ensures excellent long-term outcomes.

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