

ROLE OF CT VIRTUAL BRONCHOSCOPY IN MANAGEMENT OF CHILDREN WITH FOREIGN BODY ASPIRATION

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ABSTRACT

Foreign body aspiration is an accidental occurrence in paediatric age group. If misdiagnosed, it can result in serious morbidity and mortality. The variety in presentation makes timely diagnosis challenging to the surgeon. CT is an alternative imaging modality in the evaluation of foreign bodies and their complications. Virtual bronchoscopy (VB) is a non invasive technique that utilizes a variety of software programs to provide three dimensional views of trachea bronchial tree using spiral MDCT. It helps in confirming diagnosis, nature, location of foreign body and also helps in planning the management. If possible we should always advise CT scan along with virtual bronchoscopy to make early diagnosis as time is the key to save patient's life.

Key words: VB- Virtual Bronchoscopy, MDCT- Multi-detector CT , FB- Foreign Body , FBA- Foreign Body Aspiration

1. INTRODUCTION

As defined by Chevalier Jackson a foreign body is "an object or a substance that is foreign to its location." Children less than 4 years are more susceptible to FB aspiration due to lack of molar teeth, tendency to explore objects with mouth, crying or yelling while eating, and poor neuromuscular coordination while swallowing (1-2).

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CT is an alternative imaging modality in the evaluation of foreign bodies and their complications. Multi-detector CT (MDCT) increases scan speed and allows us to obtain near-isotropic submillimeter volumetric data and create high-quality multi-planar reconstructed (MPR) and three-dimensional (3D) reconstructive images including virtual bronchoscopy (VB) (3).

Virtual bronchoscopy provides an internal rendering of the tracheobronchial walls and lumen. Because of a perspective-rendering algorithm, virtual bronchoscopy simulates an

endoscopist's view of the internal surface of the airway (4). In presence of high clinical suspicion and inconclusive chest x-ray, CT virtual bronchoscopy must be advised in all cases to avoid unnecessary invasive rigid bronchoscopy.

2. MATERIAL AND METHODS

This is a case series of five cases of suspected foreign body aspiration. In all cases patients came to our emergency department with or without respiratory symptoms.

In some cases patients already had x-ray neck or chest with them but due to variable probability of foreign body being radioopaque or radiolucent, we straight away advocated the CT virtual bronchoscopy. Once the diagnosis is confirmed by history, clinical examination, radiological investigation and well informed consent all patients underwent rigid bronchoscopy and foreign BODY WAS REMOVED SUCCESSFULLY.

3. DISCUSSION

In pediatric age group, foreign body aspiration (FBA) causes substantial morbidity and mortality. It also leads to psychological anguish for children and the parents (5).

High index of suspicion is needed to rule out F.B. aspiration (6). The classic triad of cough, wheeze, and diminished breath sounds is not universally present (7). Presenting symptoms and signs may include coughing, dyspnea, wheezing, cyanosis, and stridor, which can mimic multitude of other illnesses, such as upper respiratory tract infection, asthma, and pneumonia (8).

FB is radiolucent in 80-96% cases but chest x-ray AP view can demonstrate some indirect signs of obstruction eg. atelectasis, emphysema, consolidation, hyperinflation etc. In such cases MDCT scan has very important role in diagnosis and management. It takes only few seconds in cooperative patients thus can be performed in children without sedation (9).

MDCT axial images cannot accurately display morphology, longitudinal involvement of trachea or primary bronchus, extramural invasion, distance from carina, degree of luminal obstruction. Therefore MDCT scan and its post-processing techniques eg multi-planner reformation (MPR), volume rendering (VR), and virtual bronchoscopy (VB) could complement to each other to disclose abovementioned information (10).

Virtual bronchoscopy (VB) is a noninvasive technique that utilizes a variety of software programs to provide three dimensional views of tracheobronchial tree using spiral MDCT. VB takes advantage of the natural contrast between the airway and surrounding tissue to determine the location, shape, size and type of FB. MDCT virtual bronchoscopy can help in planning of tracheobronchial FB removal as clinician simulate procedure before actual bronchoscopy takes place (11).

Case 1:

A 8 year old male presented to ENT emergency with complain of cough, dyspnoea, and fever since 3-4 days with no history of FB aspiration. On examination reduced air entry present on right side along with some wheezing. Saturation was around 96% on room air. On clinical suspicion we advised CT virtual bronchoscopy which revealed hyperdense FB in right bronchus [fig.1 (a)(b)(c)]. Emergency rigid bronchoscopy was done and FB tamarind seed removed in piecemeal [fig.1(d)].

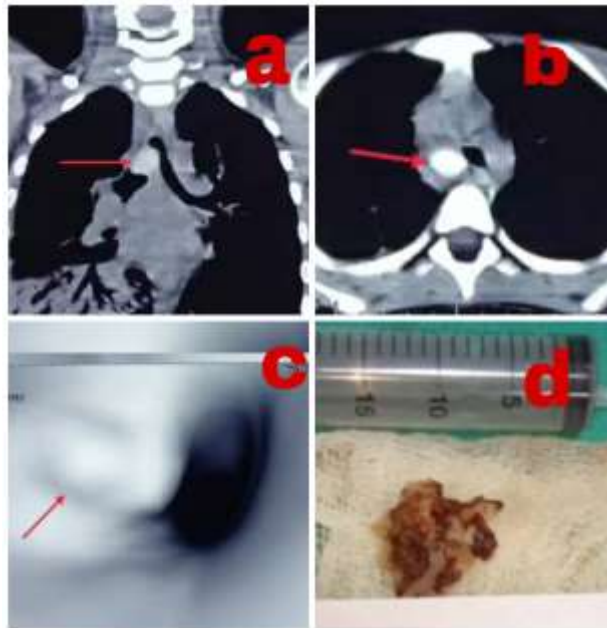


Fig.1 (a),(b): MDCT image coronal and axial scan showing hyperdense FB in right bronchus
Fig.1(c): virtual bronchoscopic image of the same
Fig.1 (d): F.B. tamarind seed after removal

Case 2:

A 7 year old girl brought to the ENT emergency room with suspicious history of FB aspiration and complaining of cough, throat pain and discomfort. On examining the patient saturation was 98% on room air, reduced air entry on left side but no additive sounds on auscultation and no chest retractions. CT virtual bronchoscopy advised which confirmed presence of FB in left main bronchus [fig.2 (a)(b)]. Patient is posted for emergency rigid bronchoscopy and FB plastic whistle retrieved successfully [fig.2(c)].

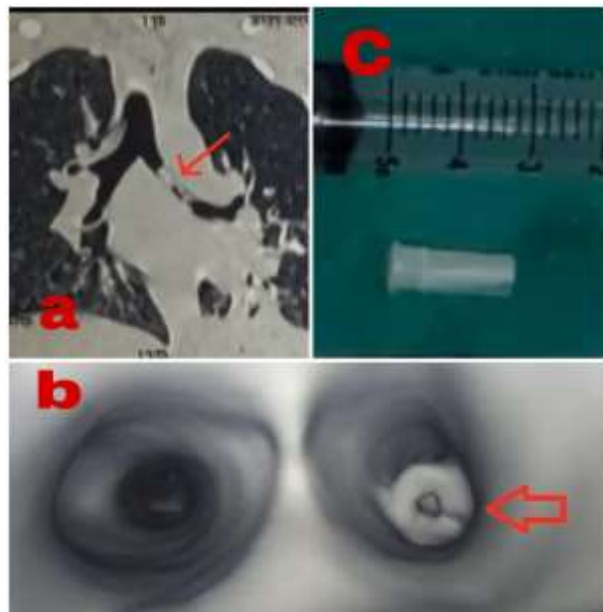


Fig.2 (a),(b): MDCT coronal and virtual bronchoscopic image respectively
Fig.2(c): FB whistles after successful removal

Case 3:

One year old male child presented to us with intermittent coughing, dyspnoea and few episodes of fever. His saturation level was 93% on room air. Clear suprasternal and intercostal retractions were visible and air entry was reduced on left side. On CT virtual bronchoscopy hyperdense FB seen in left main bronchus [fig.3(a)(b)(c)]. Rigid bronchoscopy was done and FB seetafal seed removed [fig.3 (d)].

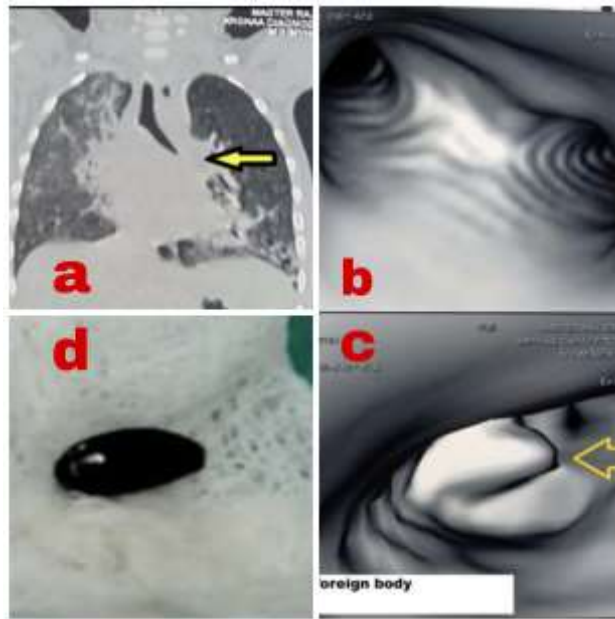


Fig.3 (a): coronal MDCT and (b),(c): virtual bronchoscopic image of carina and left bronchus showing FB.

Fig.3 (d): FB seetafal seed

Case 4:

A 3 year old male child came to ENT department with complaints of fever, cough and difficulty in respiration since 5-6 hours. History of FB aspiration was negative. Saturation was 96% on room air and right side air entry was reduced. Right side wheezes present but no chest indrawing. CT virtual bronchoscopy reported FB in right bronchus [fig.4(a)(b)(c)]. Rigid bronchoscopy performed and FB tamarind seed removed [fig.4 (d)].

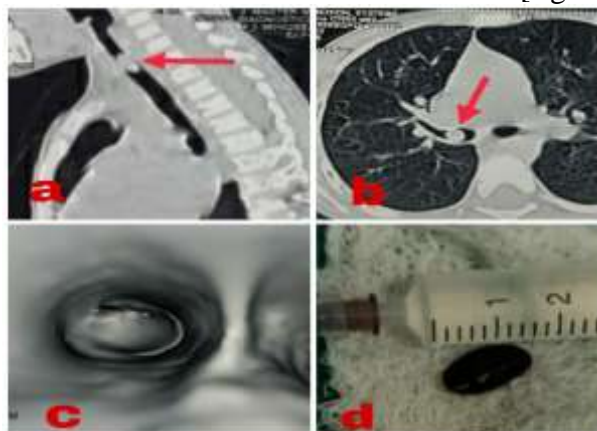


Fig.4 (a),(b):sagittal and axial cuts of MDCT chest

Fig.4(c): virtual bronchoscopic image

Fig.4 (d): FB tamarind seed

Case 5:

A 11 year old male child presented with history of foreign body whistle aspiration 5 days back, how ever on further questioning and detailed history taking, attenders accepted that they manipulated history and the child had aspirated 30 days back and has been having intermittent cough since then. On clinical examination patient was vitally stable, afebrile, respiratory rate normal, pulse and saturation normal. On respiratory examination bilateral air entry equal and right lower lobe region had coarse crepitation and rhonchi on auscultation. HRCT chest and CT virtual bronchoscopy was within normal limit except a focal peripheral calcification involving right lower lobe bronchus causing its narrowing [Fig.5(a)(b)(c)]. Inconclusive CT findings and positive history further raised the suspicion. We planned to explore and after well informed consent posted the case for rigid bronchoscopy under GA. Intraoperatively some plastic FB was seen in right lower lobe bronchus which we removed and it was a whistle [fig.5(d)]. It was tubular in shape and hollow from inside , explaining why on CT scan narrowing was seen and why the patient was maintaining normal saturation.

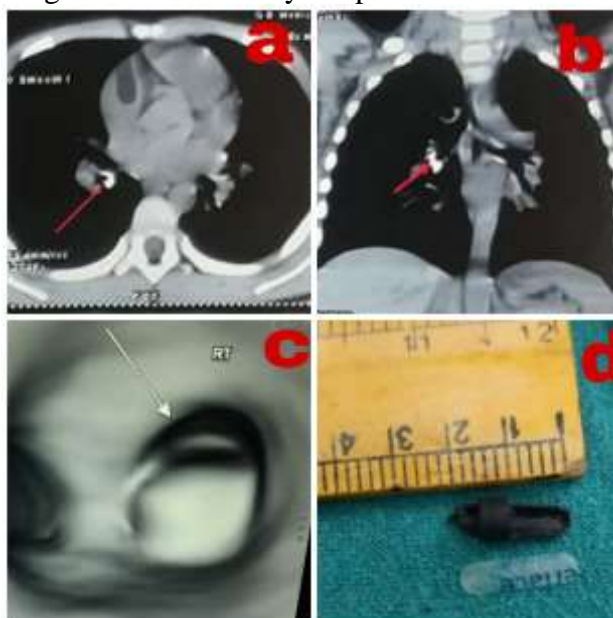


Fig.5 (a),(b),(c): axial, coronal and virtual bronchoscopic image of CT scan

Fig.5 (d): FB whistle

4. CONCLUSION

Foreign body aspiration is an accidental occurrence in paediatric age group. If misdiagnosed, it can result in serious morbidity and mortality. If the patient is stable and there is doubtful history then one must always advise CT virtual bronchoscopy. If possible patient should be shifted in Oxygen support and under supervision of paediatric expert. At times virtual bronchoscopy can also be inconclusive like in our case number 5 , and also in cases of very thick mucus plug in airways. In this scenario rigid bronchoscopy is the gold standard to diagnose as well as to retrieve any foreign body.

5. REFERENCES

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