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An inhaled foreign body (FB) in a child can be easily missed if the diagnosis is not considered, particularly if a history of choking or coughing is not forthcoming, or the episode of aspiration is unwitnessed. Once the diagnosis is suspected a chest radiograph (CXR) is invariably requested. This may provide clues to the diagnosis but a normal CXR does not rule out FB aspiration. Radio-opaque foreign bodies are easily localised, usually within a major airway. However, it can be difficult to identify the radiographic signs associated with an inhaled FB that is not radio-opaque—for example, food or small plastic objects. The presence of an intraluminal FB within the trachea or a bronchus often results in secondary changes in the associated lung or pulmonary lobe. One of the most important signs to identify is obstructive emphysema, or overinflation of the lung or lobe distal to the airway obstruction.

Laryngeal or tracheal FBs can be life threatening if the obstruction is not rapidly cleared, and these children do not usually require imaging in order to make the diagnosis. More commonly, aspirated FBs lodge in either a main or lobar bronchus. There should be no delay in recognising the need for intervention in a symptomatic child. But it is important to remember that organic material such as nuts or beans may swell in the airway, and the inflammatory response to an airway FB may further narrow the lumen. So, even in an asymptomatic child, there is potential for increased airway obstruction and asphyxia if foreign body aspiration is unrecognised. Other complications of FB aspiration are pneumonia, lung abscess, acute and chronic lung or lobar collapse, and permanent dilatation of airways distal to the obstruction—bronchiectasis.

RECOGNISING THE SIGNS

The CXR may be normal and therefore it is important to have a high index of suspicion, particularly when there is a strongly suggestive history, witnessed choking episode, or clinical signs on examination. When considering FB aspiration, *inspiratory and expiratory* chest radiographs should be requested. The conventional CXR you are used to viewing is taken ideally in full inspiration, and in the normal situation both lungs are well expanded. On expiration the lungs become smaller in volume and less radiolucent/less black. If the airways are clear of obstruction and there is no lung pathology, each hemithorax should have a uniform radiolucency in inspiration and a relative increase in density after expiration. An airway FB can partially obstruct the airway by acting like a ball valve, allowing air into the lung but not out. When this occurs, air is retained or trapped in the lung or lobe resulting in obstructive emphysema, sometimes referred to as air trapping.

INHALED FOREIGN BODIES: KEY POINTS

- ▶ A normal chest radiograph (CXR) does not rule out foreign body (FB) aspiration
- ▶ A high index of suspicion is essential even without supportive history
- ▶ Consider FB aspiration in a child of any age who does not improve with treatment or with persisting CXR changes
- ▶ Request inspiratory and expiratory chest radiographs if you suspect FB aspiration
- ▶ Look for indirect CXR signs such as air trapping/lobar overinflation
- ▶ Missing the diagnosis can result in life threatening asphyxia or permanent lung damage

FURTHER READING

- 1 Zerella JT, Dimler M, McGill LC, *et al.* Foreign body aspiration in children: value of radiography and complications of bronchoscopy. *J Pediatr Surg* 1998;33:1651–4.
- 2 Lima JA, Fischer GB. Foreign Body aspiration in children. *Pediatr Respir Rev* 2002;3:303–7.
- 3 Karakoç F, Karadağ, Akbenlioğlu C, *et al.* Foreign body aspiration: what is the outcome? *Pediatr Pulmonol* 2002;34:30–6.
- 4 Tokar B, Ozken R, İlhan H. Tracheobronchial foreign bodies in children: importance of accurate history and plain chest radiography in delayed presentation. *Clin Radiol* 2004;59:609–15.
- 5 Babin E, Sigston E, Bignon J-Y, *et al.* How do we do it: management of tracheobronchial foreign bodies in children. *Clin Otolaryngol* 2004;29:750–7.

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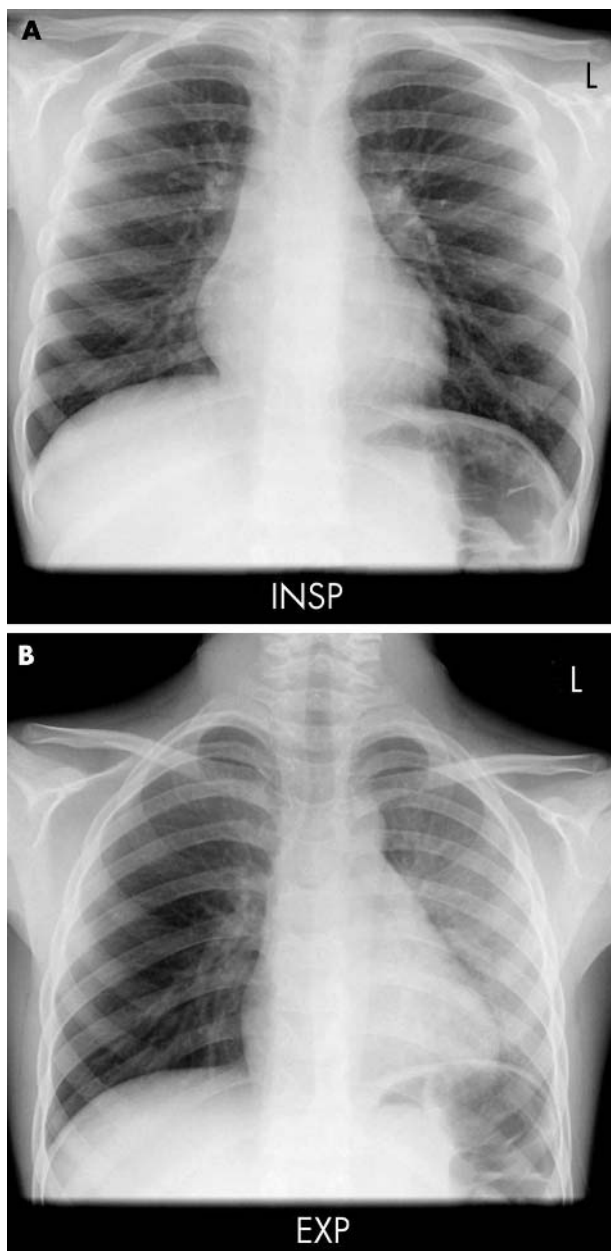


Figure 1 Case 1: inspiratory and expiratory chest radiographs.

CASE 1

Case 1 is a 9 year old boy who had bitten on a Lego toy to loosen a small piece of it and suddenly choked, feeling a pain in his throat. He presented to hospital the following day complaining that it felt stuck in his throat. He was apyrexial with no respiratory symptoms, but mild wheeze was heard on deep inspiration. His inspiratory CXR is normal (fig 1A). On the expiratory radiograph (fig 1B) the left lung has reduced in volume and there is also decreased volume and increased density in the right upper lobe, which are normal findings on expiration. However, the right middle and lower lobes remain as radiolucent as on the inspiratory CXR—air trapping—because the piece of Lego is lodged in the bronchus intermedius. At bronchoscopy the piece of Lego

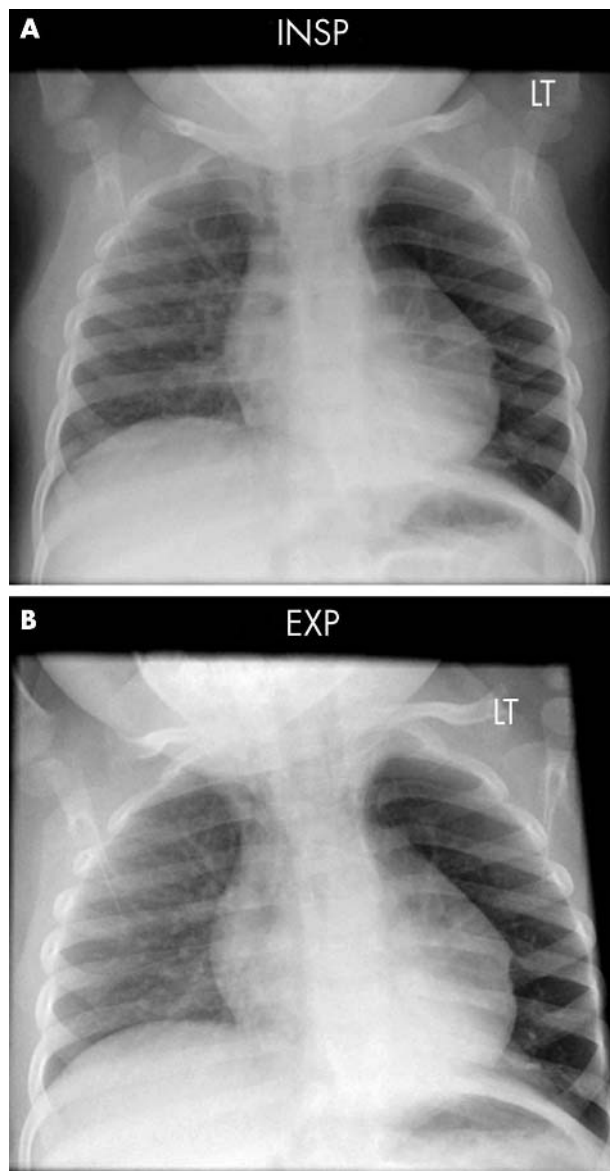


Figure 2 Case 2: inspiratory and expiratory chest radiographs.

was found to have worked its way into the right lower lobe bronchus.

CASE 2

Case 2 is a 20 month old boy who had a witnessed choking episode while eating a pistachio nut. Initially well, he presented the following day with fever, cough, dyspnoea, and mild hypoxaemia. His inspiratory CXR (fig 2A) shows an overinflated left upper lobe (LUL), and a triangular density behind the heart, with non-visualisation of the medial aspect of the left hemidiaphragm consistent with left lower lobe (LLL) collapse. On the expiratory CXR (fig 2B), there is the normal slight increase in density of the right lung, but the appearances of the left hemithorax are unaltered. A piece of pistachio was removed from the left main bronchus. CXR was normal on follow up two weeks later.

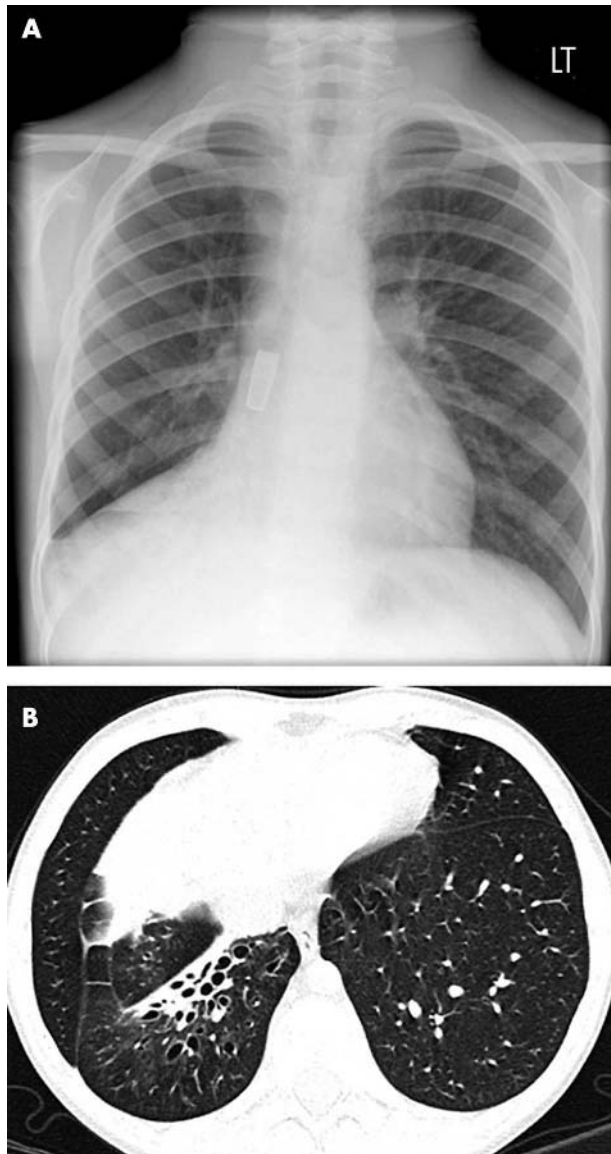


Figure 3 Case 3: chest radiograph and high resolution computed tomography scan.

CASE 3

This 8 year old boy inhaled part of a pencil base three months before hospital admission. At the time he had a bout of coughing but no severe respiratory distress. He was seen several times by his family doctor because of recurrent cough and wheeze. A diagnosis of asthma was made but bronchodilators did not relieve his symptoms. At the time of admission he had developed chest pain and fever. His CXR (fig 3A) shows a metallic FB in the right bronchus intermedius with collapse of the right lower lobe (RLL) and part of the middle lobe, as the right cardiac border is not clearly seen. The pencil part was removed by rigid bronchoscopy and further management included antibiotics, steroids, and physiotherapy. Seven months later there was persisting RLL volume loss and radiographic evidence of bronchiectasis, which was confirmed on high resolution computed tomography (HRCT) (fig 3B). The HRCT scan shows permanently dilated bronchi in the partially collapsed right lower lobe. There were also less extensive changes in the right middle lobe.

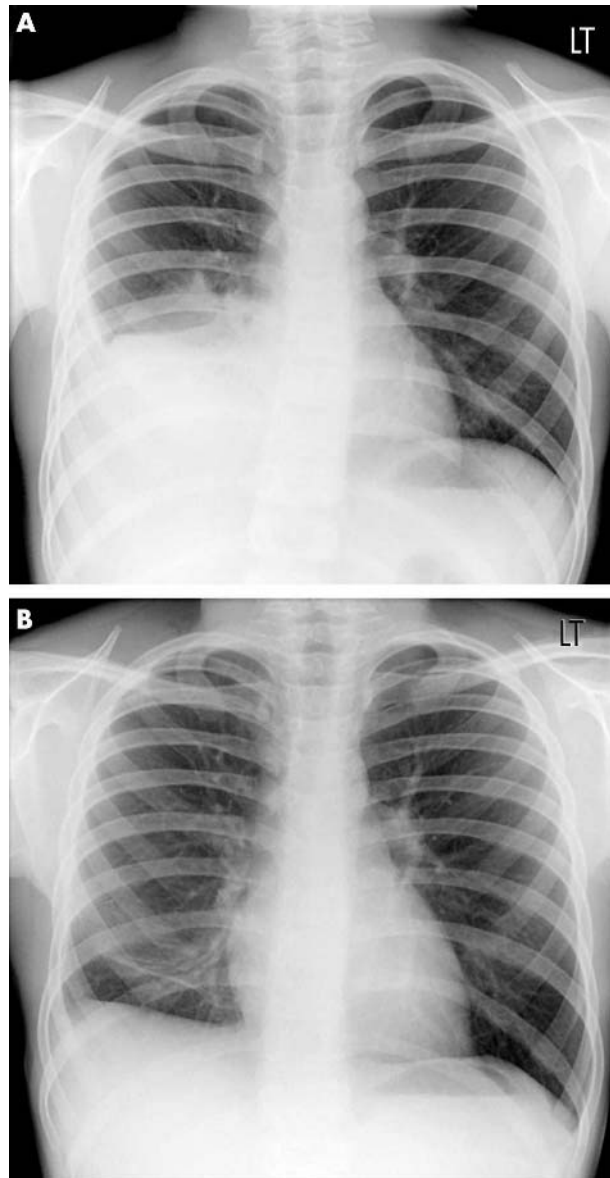


Figure 4 Case 4: Initial and follow up chest radiographs.

HRCT scans are fine section images (1–2 mm) of the lungs, taken at intervals—for example, every 10 mm. Therefore 80–90% of the lung is excluded but this type of scan gives detailed images of the lung parenchyma and smaller airways (to view video footage of CT scans visit the *Education and Practice* website—<http://www.archdischild.com/supplemental>).

CASE 4

Case 4 is an 11 year old boy who inhaled a plastic pen top. He felt fine afterwards so did not seek help or tell anyone. Four days later he developed a cough and saw his family doctor who prescribed a course of antibiotics. Although there was some clinical improvement he developed chest pain and sputum 10 days later and was referred to hospital. CXR showed right middle and lower zone consolidation with associated volume loss and a small effusion (fig 4A). The episode of aspiration was revealed and the FB removed from the right lower lobe bronchus at rigid bronchoscopy. Two months later there is persisting mild volume loss in the RLL but appearances are much improved (fig 4B).