Case Report

Recurrent atelectasis in a previously healthy child: a case report and literature review

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Abstract

Background: Atelectasis is the partial or complete collapse of a lung or its segment. The diagnosis of atelectasis in children calls for urgent identification and management of the underlying cause. There is a need for high index of suspicion of foreign body aspiration (FBA) in children with atelectasis even in the absence of a positive history. The aim of this report is to present a case of atelectasis from foreign body aspiration (FBA), without a suggestive history, in a previously healthy boy and review the relevant literature.

Case Report: A 10-year-old boy presented with a 2-week history of cough, weight loss and fever which failed to subside on out-patient treatment. He denied history of FBA. He was managed for left lobar pneumonia with lung collapse 3 months earlier with good response. He remained well till his re-presentation with features of recurrent left lobar pneumonia and lung collapse. He was re-admitted, re-evaluated, treated with remarkable improvement, then referred for further evaluation. Repeat chest CT identified foreign body (FB) in the airway and on rigid bronchoscopy, a biro end was extracted. Similar symptoms have not recurred.

Conclusion: Primary care providers and paediatricians must remain alert to FBA as a cause of atelectasis even in the absence of a positive history.

Keywords: Atelectasis, foreign body aspiration, lung collapse, lobar pneumonia

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INTRODUCTION

Atelectasis is the partial or complete collapse of a lung or its segment. It was derived from two Greek words *ateles* (imperfect) and *ektasis* (expansion) literally translated as "imperfect expansion". [1] It occurs when air in the alveoli is reduced or completely lost causing loss of lung volume and collapse. This impairs carbon dioxide and oxygen exchange, causing pulmonary hypoxia. The body compensates by vasoconstriction in the affected parts of lungs and redirects blood to normal areas. Hyper-inflation of the contralateral lung may occur. If atelectasis is severe, these compensatory mechanisms may fail leading to intrapulmonary shunting, perfusion/ventilation mismatch, hypoxaemia, respiratory distress and failure. [1,2]

Atelectasis is more common in children than adults due to their smaller, more compliant airway and incompletely developed collateral ventilation pathway. [3] It has no race or sex

predilection. The incidence depends on underlying cause with rates of 1.62% - 36% among children with asthma, [4,5] 12- 41% in children with foreign body aspiration (FBA), [6] and over 90% among children on positive pressure ventilation via tracheal tube. [7] It also occurs in children with pneumonia. [8,9] Atelectasis is a manifestation of an underlying disorder which must be identified and managed. There is a need for high index of suspicion for FBA as a cause of recurrent atelectasis even in the absence of a suggestive history. The aim of this report is to present a case of atelectasis from foreign body aspiration (FBA), without a suggestive history, in a previously healthy boy and review the relevant literature.

CASE REPORT

A 10-year-old boy presented with a 2-week history of recurrent non-productive cough, weight loss and fever. He was initially managed on out-patient basis for malaria and upper respiratory tract infection without improvement before he was referred to the Paediatrician.

He denied history of symptoms suggestive of FBA, contact with anyone with chronic cough, past medical and family history of asthma or any chronic medical condition. He was admitted into the hospital 3 months earlier with a history of fever, cough, breathlessness and night sweats. He had denied history of FBA. He weighted 45kg. Physical evaluation and chest radiography (Figure 1) suggested left lobar pneumonia with left lung collapse and minimal effusion. He was successfully managed with intravenous Ceftriaxone and discharged to outpatient follow-up. Repeat chest radiograph seven weeks later was normal (Figure 2).

On re-presentation, he was alert, not in respiratory distress, well-nourished, weighed 46.10Kg with no peripheral lymphadenopathy. Temperature was 38.4^{o} C, respiratory rate 32/min, pulse rate 89/min and SPO_2 96% in room air. On inspection, he was tilted towards his left. Trachea was central on palpation, with slightly reduced chest expansion over left lower lung field. Percussion note was normal bilaterally. Bronchial breath sounds with reduced air entry was heard over left lower lung field, there was no rhonchi or crackles. Right lung field and other physical findings, including neurologic evaluation were normal. Chest radiograph showed left lower lobe consolidation and partial collapse (Figure 3). Hemoglobin concentration was 10.3 g/dl; white cell count 16.3 x 10^9/l with Neutrophilia of 85%, suggesting bacterial infection. ESR was 54mm/hour and C-reactive protein 65.25 mg/l, both raised, supporting an inflammatory process. GeneXpert for tuberculosis was negative. Chest CT reported left lower lobe collapse/consolidation likely from infective pneumonitis with differentials of atypical pneumonia and tuberculosis. Bronchoscopy and endobronchial washings for microbiology were advised.

The working diagnosis was recurrent left lobar pneumonia with atelectasis, to exclude pulmonary tuberculosis, atypical pneumonia and FBA. He was admitted and given intravenous Ceftriaxone and oral azithromycin with remarkable clinical and radiologic improvement.

Following the diagnosis of recurrent atelectasis and CT report obtained, parents were counselled and patient referred for bronchoscopy. Repeat Chest CT done surprisingly showed FB in the airway and using rigid bronchoscopy, a blue biro stopper (Figure 4) was removed. The CT images were missing as the parents misplaced it. Similar symptoms have not recurred for over 12 months of follow up of this patient.

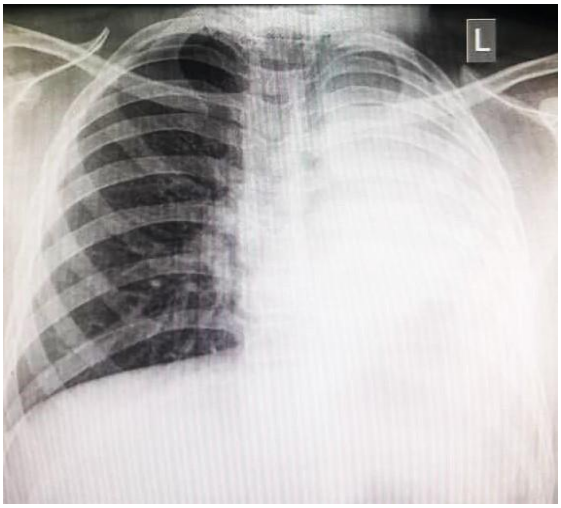

Figure 1: Chest radiograph on presentation

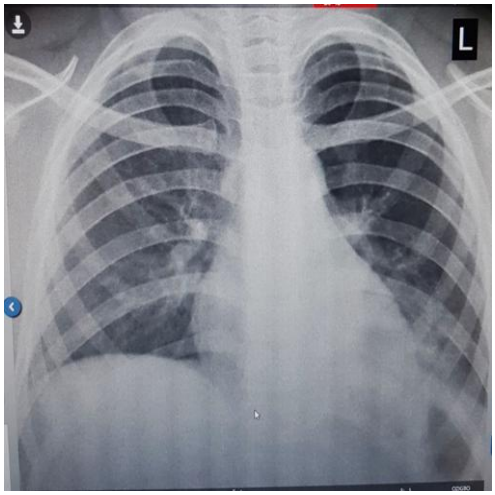

Figure 2: Repeat chest radiograph after 7 weeks

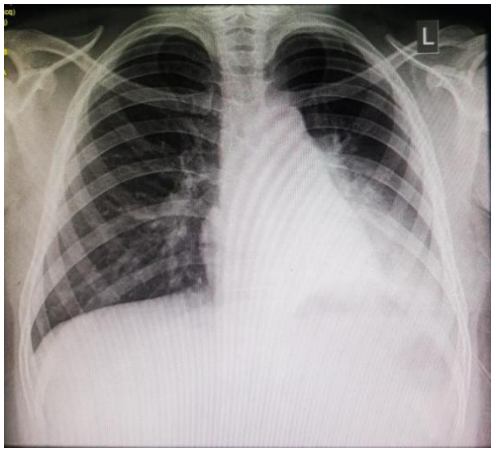

Figure 3: Chest radiograph on representation

Figure 4: Foreign body – blue biro end plug

DISCUSSION

Atelectasis is not uncommon in children and may occur in many lung disorders. It is broadly categorized into obstructive and non-obstructive atelectasis based on the underlying pathological mechanism. [1] Obstructive is the most common type in children due to their narrow, more collapsable airway.[3] Partial or complete obstruction of airway to a lung lobe or segment causes resorption of air distal to the obstruction resulting in airway and alveolar collapse. The obstruction could be intraluminal from FB, mucous plugs and tumours; extraluminal from lymph node enlargement, tumours, aneurysms, or mural from fibrotic strictures and neoplasms. [10, 11] Predisposing factors include asthma, pneumonia, neuromuscular disorders, post-operative or post-anaesthetic conditions. [9, 12]

FBA is an important cause of obstructive atelectasis in children. [13, 14] It is more common in males and children below 3years; implicated objects include organic materials such as peanuts, and seeds, and inorganic objects like metals, toys, and pen caps. [14 -16] There is usually a history of FBA, choking, sudden onset of cough, wheezing, and difficulty with breathing. [17 -19] Neurologically impaired children are at increased risk with delayed presentation and diagnosis if unwitnessed. [20] Occult FBA is more common in males and children below 3 years, with most initially misdiagnosed as pneumonia. [21] Being a male increased the risk in this case, but he was a neurologically intact 10-year-old child with expected lower risk. Consequences of FBA include fatal outcome such as death, or delayed consequences including pneumonia, atelectasis, bronchiectasis and lung abscess. [22, 23] Pneumonia and atelectasis manifested in this patient.

Non-obstructive atelectasis refers to others with underlying mechanisms not directly from airway obstruction.[1] They include compression atelectasis from increased external pressure to the lungs and impaired alveoli inflation, and relaxation atelectasis from loss of normal negative pressure in the pleural space causing lung recoil; pleural effusion or pneumothorax may predispose to both. Others are adhesive atelectasis from surfactant deficiency, dysfunction or both as may occur in preterm infants; cicatrization atelectasis from chronic

lung tissue destruction, scarring and contraction which may be caused by tuberculosis, and replacement atelectasis from tumours filling lung alveoli. Conditions predisposing to non-obstructive atelectasis were absent in this case.

Symptoms and signs of atelectasis vary depending on the extend of lung involvement, rapidity of development, underlying and associated factors. [9] Patients are usually asymptomatic if few alveoli are affected but become symptomatic as more get involved. Common symptoms include cough, chest pain, difficulty with breathing and wheezing. Only cough was present on representation, with tilting towards his left, a possibly compensatory position for chest pain. History of FBA, choking or sudden onset cough, wheezing or breathlessness are pointers to possible FBA. This was not obtained probably due to recall bias, underestimation of the incident or concealment due to fear. Physical findings include tachypnoea, increased work-of-breathing, tracheal or mediastinal deviation to affected side depending on the extent of lung involvement, decreased chest expansion with dull percussion notes and decreased breath sounds and crackles on affected side. [1, 9] Only slightly reduced chest expansion and reduced air entry over left lower lung field were found in this case. This was probably because it was partial, insidious in onset and not extensive; co-existing lobar pneumonia may have masked some findings.

Chest radiography is commonly used to confirm the diagnosis. [9] Anterior-posterior and lateral views should be performed. Direct signs are bowing of interlobar fissures towards the collapsed lobe and crowding of pulmonary vessels on affected side. Indirect signs include uniform opacity over collapsed lung area, denser and triangular appearance of the collapsed lobe with apex pointing to the hilum, compensatory hyperinflation of non-atelectatic lung, crowding of ribs and elevation of diaphragm on side of collapse, and mediastinal shift toward affected side. [2,24] These were present on the initial chest radiograph (Figure 1) but less marked on re-presentation (Figure 3).

Chest computed tomography (CT) is more sensitive than chest radiograph and can help identify the underlying cause. Intravenous contrast enhancement helps to differentiate atelectasis from consolidation. [2, 24] Surprisingly, FB, was not seen in the first chest CT, but was identified in the repeat; scan quality and interpreter's skills are possible contributory factors. Lung ultrasound, though not done, is a sensitive, cost-effective, bed-side investigation for the diagnosis of atelectasis especially in critically ill patients. [25, 26] Complete blood count done suggested an infective process, which on hind sight was a secondary rather than the primary pathology. Bronchial wash-out culture and cytology may be done if indicated.

Bronchoscopy, rigid or flexible fiberoptic, is a diagnostic and therapeutic procedure for air way evaluation in children. [27, 28] It enables identification of the underlying cause, FB removal, therapeutic lavage, and drug application. Both techniques can be safely used for the removal of aspirated FB in children; while the more suitable remains a subject of debate, choice of technique should be individualised. [29] Rigid bronchoscopy was available and safely used in this case.

CONCLUSION

FBA is an important cause of atelectasis in children. The diagnosis may be difficult in the absence of a positive history. Primary care physicians and pediatricians must maintain high index of suspicion of FBA in children with atelectasis even in the absence of a suggestive history. Bronchoscopy is indicated for persistent or recurring atelectasis.[28] Appropriate referral of children with these conditions for further evaluation and management is important because delayed intervention significantly increases risk of complications from FBA. [30]

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