Spontaneous Pneumomediastinum Complicating Pneumonia in Children

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Introduction

Spontaneous pneumomediastinum (SPM) following pneumonia is an uncommon entity in paediatric practice. The prevalence of SPM is reported between 1 in 800 to 1 in 42000 by Chalumeau et al [1]. Damore et al [2] in a retrospective study reported a prevalence of 0.2% in children presenting in the emergency room with underlying asthma and acute exacerbation. 70% of cases of pneumomediastinum in children are due to bronchospasm or respiratory tract infection [3]. We describe two cases of spontaneous pneumomediastinum in children which developed during an episode of pneumonia without any history of bronchial asthma, trauma or foreign body aspiration. While the first case recovered spontaneously the second case had malignant pneumomediastinum requiring placement of a mediastinal drain and intercostal drainage tube. The cases highlight the varied clinical course of pneumomediastinum from spontaneous resolution to a fatal outcome.

Case Report

Case 1

A two year old girl was admitted with fever, cough and severe breathlessness of two days duration. Her other complaint was swelling that appeared over the neck and then progressed to involve the face, chest, trunk and abdomen upto the inguinal region over 24 hours. The child was extremely irritable and was not accepting feeds. She did not have any history suggestive of asthma or foreign body ingestion. Examination revealed the child to be febrile (38.9°C) and dyspnoeic. Her pulse rate was 136/min, respiratory rate was 70/min and BP 96/70 mmHg. Her SpO₂ was 84% in room air and she had central cyanosis. Subcutaneous emphysema was present over both supraclavicular fossae, neck, face, chest, trunk and abdomen. Bronchial breath sounds were

heard in the right infraclavicular and mammary regions. "Mediastinal crunch" (Hamman's Sign) was present. Heart sounds were normal and other systemic examination was essentially normal. A chest radiograph (Fig. 1) showed subcutaneous emphysema over supraclavicular fossae, chest and abdomen. Pneumomediastinum was also evident along with a nonhomogenous opacity in the right upper zone. A computed tomography (CT) chest also confirmed the presence of pneumomediastinum, subcutaneous emphysema and consolidation Rt upper lobe (Fig. 2). The total leukocyte count showed leucocytosis with predominant polymorphs and peripheral smear showed shift to the left with toxic granules. The ECG and biochemical parameters were essentially normal. She was treated with oxygen inhalation, antibiotics (Inj Ceftriaxone + Inj Amoxycillin-Clavulanic acid) along with inhaled bronchodilators (salbutamol) and supportive care. Blood and sputum culture were sterile. Her condition improved over the next 72 hours but the subcutaneous emphysema persisted without producing any discomfort. This

Fig. 1 : Chest radiograph showing subcutaneous emphysema in the neck, chest and abdomen and a non homogenous opacity in the right upper zone with pneumomediastinum

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Fig. 2 : a) CT chest showing pneumomediastinum, subcutaneous emphysema and consolidation right upper zone (arrows). b) CT chest showing pneumomediastinum, subcutaneous emphysema and consolidation right upper zone (arrows).

subsided slowly and spontaneously over the next ten days. The pneumonia also responded to antibiotics and by the tenth day of admission her chest radiograph showed clearing of the non-homogenous opacity and resolution of the pneumomediastinum.

Case 2

A 19 month old male child presented with history of fever, cough and breathlessness of four days duration. On examination, the child was toxic looking with severe respiratory distress. He was not a known case of asthma and there was no history suggestive of foreign body aspiration. He was febrile (38.7°C), tachypnoeic (78/min) having SpO₂ of 76% with free flow oxygen. He had cyanosis. Respiratory system examination revealed bilateral crepitations. His chest radiograph (Fig. 3) showed bilateral consolidation with pneumomediastinum (Rt) and pneumothorax (Rt). The hematological evaluation showed leucocytosis with predominant polymorphs. A right sided intercostal drainage tube was inserted and he was put on ventilatory support (PEEP 5cm H₂O, PIP 14 cm H₂O, I: E 1:3). Antibiotics (Inj.Ceftriaxone and Inj.Vancomycin) were started. Blood culture grew *Staphylococcus aureus* sensitive to vancomycin.

Fig. 3 : Chest radiograph showing pneumomediastinum (Rt) and pneumothorax (Lt) (arrows) with collapsed left lung. The intercostal drainage tube can be seen on the right.

The next day the child was detected clinically to have subcutaneous emphysema over the neck and face. A chest radiograph showed bilateral pneumothorax with collapse of the left lung. Pneumomediastinum was also present. An intercostal drainage tube was placed on the left side and ventilation continued. The child, however, deteriorated clinically and radiographically showed increase in pneumomediastinum. A mediastinal drain was put in view of the deteriorating condition of the child to decompress the chest. The child however developed septic shock followed by multiple organ failure and died.

Discussion

Pneumomediastinum, also known as mediastinal emphysema, is defined as the presence of air in the mediastinum. Spontaneous pneumomediastinum occurs in patients who have non-traumatic mediastinal air leaks [1] and is usually benign. Pneumomediastinum most frequently develops following alveolar rupture as a result of violent coughing. Other aetiological causes include air originating from the upper airways (post tracheostomy), air from intrathoracic airway, air from gastrointestinal tract (rupture esophagus) or rarely after dental extractions and obstetric delivery. It can also be caused by a traumatic injury like penetrating chest trauma or inhaled foreign body [4]. Hamman's sign described as a crunching or clicking sound, synchronous with the heart beat heard over the precordium which increases in intensity during inspiration and left lateral decubitus position, is seen in 50% of cases with pneumomediastinum [5]. The overdistension of alveoli in pneumonia is caused by obstruction due to exudates and inflammatory edema. In addition the alveolar supporting structures may get weakened by parenchymal inflammation in pneumonia. An increase of intra-alveolar

pressure causes a rupture of alveoli adjacent to pulmonary blood vessels. This produces an extravasation of air along the vascular sheaths which extends to the mediastinum. The entrapped air can either compress the great vessels in the mediastinum or rupture into the pleural cavities. It may also escape into the subcutaneous or deep tissues of the neck and track down through the diaphragm around the aorta, inferior vena cava and esophagus into the retroperitoneal tissues. Diagnosis of mediastinal emphysema is not difficult provided it is kept in mind. The usual clue to diagnosis is the presence of subcutaneous air in the neck and over the abdomen, as in our case. The diagnosis is confirmed by a chest radiograph, illustrating multiple thin, lucent streaks outlining mediastinal structures, elevating the mediastinal pleura and often extending into the neck or chest wall [6]. Computed tomography is usually reserved where findings on plain radiograph are inconclusive. Recently ultrasound has been used to diagnose pneumomediastinum as a bedside procedure especially in critically ill patients [7]. Majority of patients with pneumomediastinum follow a benign course and resolve spontaneously with prompt treatment of the underlying cause (pneumonia in our case) and measures to reduce the intra-alveolar pressure by oxygen, steroids, and bronchial antispasmodics. Rarely, pneumomediastinum may be extensive and would require surgical treatment. Such a state is called "malignant pneumomediastinum." This is a situation where large volume of entrapped air interferes with adequate circulation and respiration. Cervical mediastinotomy with or without tracheostomy is life saving in these cases.

To conclude, pneumomediastinum, though a known complication of pneumonia is not commonly seen. A high index of suspicion is required to diagnose this entity clinically. The outcome of pneumomediastinum varies from a benign course to a malignant and progressive one. When the mediastinal pressure interferes with the circulation and lung expansion, it can have a fatal outcome. Early recognition and management of the underlying cause along with good supportive care helps in resolution of pneumomediastinum.

Conflicts of Interest

None identified

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