

## **Pneumomediastinum and Subcutaneous Emphysema associated with Asthma Exacerbation**

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### **Abstract**

The case of a nineteen year old male student who presented with marked dyspnoea, dysphagia and hoarseness of voice is presented. Chest examination revealed bilateral polyphonic rhonchi and the chest radiograph showed the presence of subcutaneous emphysema and pneumomediastinum. A diagnosis of acute severe asthma complicated with subcutaneous emphysema and pneumomediastinum was made and the patient was managed conservatively on nebulized salbutamol, steroids, oxygen and chest physiotherapy. He made a remarkable improvement and has remained in a stable clinical condition.

### **Introduction**

Asthma is defined as a disorder characterized by chronic airway inflammation and increased airway responsiveness resulting in symptoms of wheeze, cough, chest tightness and dyspnoea.<sup>1</sup> Pneumomediastinum (air in the mediastinum) was first described as a complication of

trauma in 1819 by Laennec.<sup>2</sup> Although subcutaneous emphysema and pneumomediastinum are relatively uncommon, they are important complications of asthma. Their sudden and usually unexpected onset have the hallmark of an emergency.<sup>3</sup> The first definite case of childhood asthma complicated by subcutaneous emphysema was reported in 1850, although signs and symptoms of subcutaneous emphysema were recognized by Laennec as early as 1819.<sup>3</sup> A number of cases have since been reported but an understanding of the underlying pathology of the condition was not elucidated until 1939.<sup>3</sup> Though asthma is a commonly occurring disease, the combination of asthma with subcutaneous emphysema and pneumomediastinum without pneumothorax is very rare.<sup>4</sup>

We are presenting an index case of pneumomediastinum and subcutaneous emphysema complicating asthma with a view to raising an awareness of the clinical features among doctors dealing with this condition. The management of this condition has been outlined and the existing literature reviewed.

## Case Report

A 19 year old, senior secondary school student and a known asthmatic presented to the Accident and Emergency ward of the University of Benin Teaching Hospital, Benin city with a two hour history of increasing dyspnoea, wheezing, difficulty in swallowing and hoarseness of his voice. He was diagnosed asthmatic at the age of 6 years and had 3 admissions for acute severe asthma in the past five years. Drug history revealed that he had salbutamol tablets on a regular basis. He had subcutaneous swelling and crepitus over the neck, anterior and posterior chest regions, bilateral and polyphonic rhonchi with prolonged expiratory phase. He had a respiratory rate of 28 cycles per minute, pulse rate of 120 beats per minutes and blood pressure of 100 / 60 mmHg. Examination of other systems was essentially normal. Laboratory findings showed a packed cell volume (PVC) of 42%, white blood cell (WBC) count of 6,000 cells/mm<sup>3</sup> with 62% polymorphonuclear neutrophils, 30% lymphocytes and 6% eosinophils. Electrolyte levels, liver function test results and electrocardiogram (ECG) were normal. The chest radiograph showed areas of lucency over the neck and both the anterior and posterior chest walls and also linear lucencies in the mediastinum with lateral displacement of the mediastinal pleura which are in keeping with subcutaneous emphysema and pneumomediastinum (Figure).

Based on the history, clinical and radiological findings, a diagnosis of acute severe asthma with subcutaneous emphysema and pneumomediastinum was

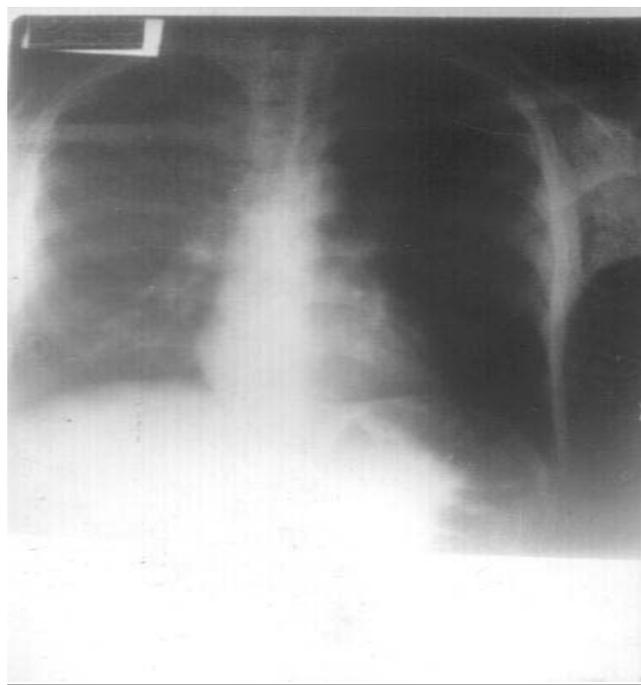


Figure.

made. He was admitted into the medical ward and was managed conservatively by a combined team of physicians, surgeons and physiotherapist. The treatment given included the administration of nebulized salbutamol, oxygen by nasal plugs and parenteral hydrocortisone; while the physiotherapist gave respiratory exercise. He made remarkable clinical improvement with resolution of the initial symptoms and signs. He was subsequently discharged after 6 days of admission and has remained in a stable clinical condition.

## Discussion

Spontaneous pneumomediastinum was initially introduced into the medical literature in 1939 by Hamman<sup>2</sup> from which "Hamman sign" (air crepitus heard on auscultation with each heart beat) is derived.

The term primary spontaneous pneumomediastinum is used to describe the presence of air in the mediastinal tissue in the absence of predisposing disease while secondary spontaneous pneumomediastinum is used where the leakage of air in the mediastinal tissue has resulted from a co-existing structural abnormality which can be in the lung or mediastinum.<sup>2,5,6</sup> Our patient had acute severe asthma as the cause of the pneumomediastinum. The other known causes of secondary pneumomediastinum include barotraumas, increased intra-thoracic pressure, valsalva manoeuvre and strenuous exercise. Unusual causes include arthroscopy, dental extraction, adenoid-tonsillectomy, diving, trombone playing and performing a maximal expiratory pressure manoeuvre.<sup>7-9</sup>

Pneumomediastinum can occur as a result of alveolar rupture and air may then track along interstitial and vascular supporting tissues until it gets to the mediastinum. Air may also track to the neck and the rest of the body resulting in subcutaneous emphysema or into the pleural space causing pneumothorax. Both asthma and pneumomediastinum are known causes of non-uniformity of the ventilation/perfusion ratio which could further cause abnormalities in the oxygenation of the arterial blood.<sup>10</sup>

The index patient presented with history of marked dyspnoea, dysphagia and hoarseness of voice. This is well known mode of presentation.<sup>2</sup> When there is an associated abdominal pain, an abdominal cause for the pneumomediastinum should be considered. Bowel perforations should be considered in the differential diagnosis of a patient presenting with pneumomediastinum and/or subcutaneous emphysema because it could be potentially fatal if untreated.<sup>2</sup> The case under review did not however experience abdominal pain.

The symptom-complex of asthma in association with subcutaneous emphysema and pneumomediastinum is

rare. One of the earliest reports is that of a 63 years old lady with acute severe asthma.<sup>2</sup> This patient was managed conservatively using steroids but no mention was made of use of salbutamol (nebulized or inhaled) and oxygen. It has also been reported in the paediatric age group.<sup>3</sup> Management in these cases was essentially conservative. The ideal treatment of this symptom complex should be treatment of acute severe asthma with conservative management being sufficient in most cases.

### Conclusion

The association of asthma with pneumomediastinum and subcutaneous emphysema is rare. Diagnosis is based on a high index of suspicion and management is purely conservative.

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