

## Spontaneous pneumomediastinum and bilateral subcutaneous emphysema; a rare case presentation in Asthmatic patient

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### ABSTRACT

*The presence of free air or gas in the mediastinal structures and the pericardial sac without a clear precipitating cause is known as spontaneous mediastinal emphysema (pneumomediastinum) and pneumopericardium. Young, healthy persons without a major underlying lung condition are less likely to experience it. Here, we presented a 15-year-old female known asthmatic patient with sudden onset of shortness of breath, dry cough, and swelling over the neck down to the abdomen. This patient was managed with asthmatic medication and oxygen conservatively and discharged from the hospital with significant improvement. Spontaneous pneumomediastinum should be taken into consideration after excluding common illnesses when a youngster complains of chest pain or tightness. Clinical characteristics and a chest CT scan can be used to diagnose SPM. Most patients with spontaneous pneumomediastinum and subcutaneous emphysema had mild to moderate sequelae and responded well to conservative therapy.*

**Keywords:** Pneumomediastinum, subcutaneous emphysema, asthma

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## 1. Introduction

Spontaneous pneumomediastinum (SPM) is a rare condition, particularly uncommon in young patients, and it has been historically associated with asthma flare-ups<sup>(1)</sup>. The main causes of SPM include coughing, vomiting, nutritional difficulties, physical activity, and drug use. In some cases, bronchospasm unrelated to asthma can co-exist with SPM. Pneumomediastinum and subcutaneous emphysema are rare side effects of acute asthma. When pneumomediastinum occurs, it can potentially compress vital organs in the mediastinum. Although most cases of SPM are benign and self-limiting, severe cases may require invasive treatments. This case report aims to enhance our knowledge about the treatment options for SPM and subcutaneous emphysema by conducting a comprehensive literature review and assessing their outcomes<sup>(2, 3, 4)</sup>.

This report outlines the case of a known asthmatic female patient who presented with a Spontaneous Pneumomediastinum and bilateral subcutaneous emphysema to Adama Hospital Medical College in 2024.

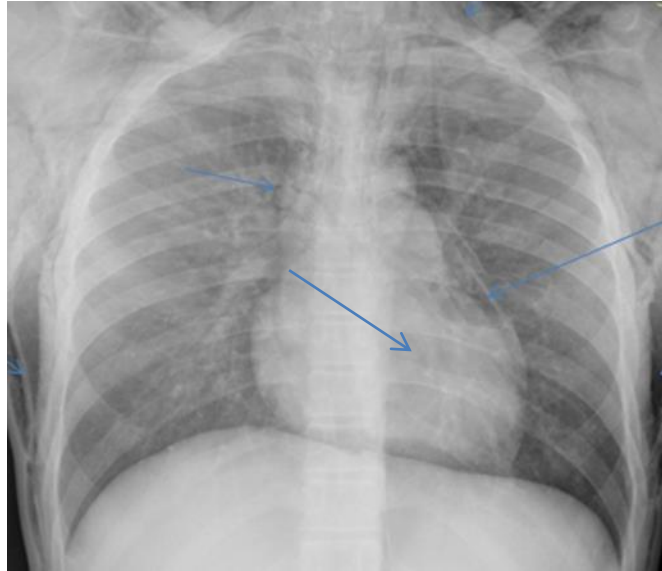
## 2. Case presentation

We present a 15-year-old known asthmatic female patient for the past three years on salbutamol puff PRN presented to our Emergency department with a history of sudden onset of shortness of breath of 1-day duration. The patient started to experience an initial dry intermittent cough after midnight while sleeping, and later on in the same day, she progressively started to witness swelling over her neck, which later began to involve her face, chest, and abdomen until she arrived at our emergency unit. Three days prior to her current complaint, she visited a nearby health center after she developed a dry cough and SOB, where she was treated with salbutamol puff and

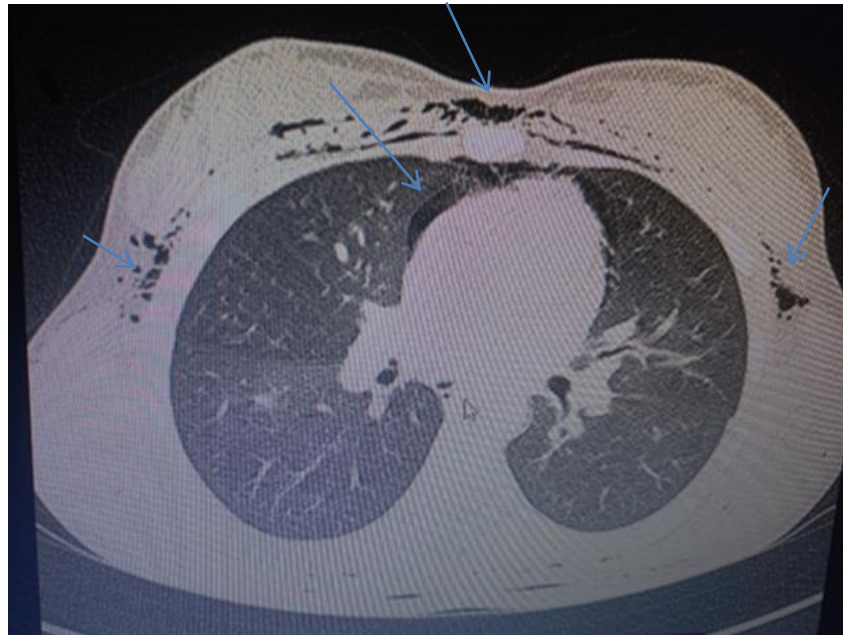
unspecified IV medication and discharged home after some improvement of her symptoms. Otherwise, she has no history of fever, trauma to the chest, or previous treatment for TB. She has no previous history of the same complaint and hospital admission for a similar illness.

On her arrival at our Emergency department, the patient was having chest tightness, SOB, and audible wheezing. She looked acutely sick and in cardiorespiratory distress with a blood pressure of 120/80, pulse rate of 124, respiratory rate of 32, a temperature of 37.1 °C, pain score of 3/10, oxygen saturation was 91% with atmospheric air and 95% with Face mask O<sub>2</sub>. Other physical examination findings showed she had a swollen face and neck with subcutaneous palpable crepitus; on the chest, there was palpable subcutaneous crepitus over the anterior and lateral aspects and diffuse wheeze all over the lung fields. On abdominal findings, she only had subcutaneous palpable crepitus, and her level of consciousness was intact. She was immediately put on face mask oxygen, and hydrocortisone 200mg IV was loaded. Then 100mg QID, started on salbutamol challenge 6puff Q20min for 2 hours, then Q1hrly with the working diagnosis of severe acute exacerbation of bronchial asthma and grade bilateral spontaneous subcutaneous emphysema with pneumomediastinum.

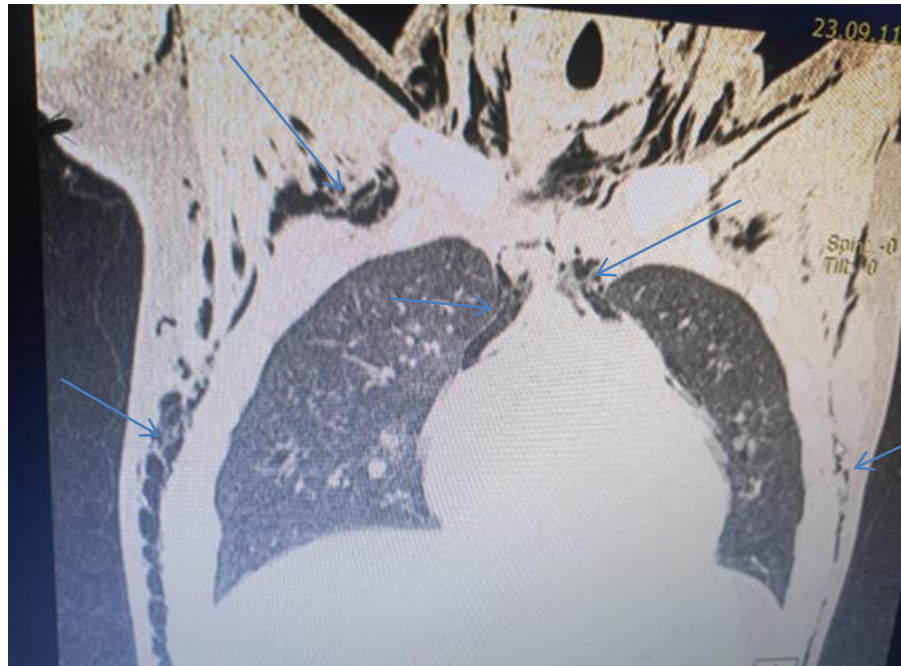
Her laboratory results were as follows: WBC: 8.5k /UL with neutrophil: 75.6%, lymphocyte: 12.6%, HCT: 46.1%, PLT: 265k/uL, Cr: 0.77mg/dl, ESR: 35mm/hr. Chest radiography showed pneumomediastinum and bilateral subcutaneous emphysema (figure 1- 3)



**Fig 1: Initial Chest x-ray showing pneumomediastinum and subcutaneous emphysema**



**Fig 2: Axial View chest CT scan showing pneumomediastinum and subcutaneous emphysema**



**Fig 3: Coronal view of Chest CT scans showing pneumomediastinum and subcutaneous emphysema**

The patient was subsequently treated with FMO2, hydrocortisone 100mg IV QID salbutamol puff. She was treated only with medical management for 7 days and then discharged to her home

with symptom improvement. On discharge, the patient's chest radiography was repeated, which showed significant improvement from the initial imaging, as shown in Figure 4.



**Fig 4: Control chest X-ray after one week with complete resolution of the pneumomediastinum and subcutaneous emphysema**

### 3. Discussion

Pneumomediastinum can be caused by three different mechanisms: a ruptured alveolus, a disruption of a cutaneous or mucosal barrier (typically

the tracheobronchial tree or the esophagus), or a disruption of a cutaneous or mucosal barrier that allows gas to enter the mediastinum. Uncommon, self-limiting illness called spontaneous pneumo-

mediastinum causes air to accumulate in the mediastinum for no apparent reason. SPM has been linked to a wide range of diseases and causes, including coughing, bronchial asthma, diabetic ketoacidosis, vigorous exercise straining, medication inhalation, delivery, violent coughing or vomiting, and other activities related to the Valsalva maneuver. According to recent case reports, SPM has also happened to people with gastric reflux disease, anorexia nervosa, when someone swallowed a foreign object like a peach seed or a pig rib, and in a patient who did yoga <sup>(5, 6)</sup>.

An uncommon side effect of acute severe asthma, subcutaneous emphysema can develop in conjunction with spontaneous pneumomediastinum, pneumopericardium, or pneumoperitoneum. An abrupt increase in intra-alveolar pressure (caused by asthma, the Valsalva maneuver, coughing, emesis, or barotraumas) causes the rupture of the marginal alveoli, which leads to the tracking of air along the bronchi, interstitial tissues, and vascular support tissues into the mediastinum. Subcutaneous cervico-facial emphysema can be caused by itinerant air molecules entering the pleural, pericardial, peritoneal space, soft tissues of the face, neck, or upper trunk. Due to the air escaping from the alveolar gaps, there is an imbalance between ventilation and perfusion, which leads to improper arterial blood oxygenation. Rapid ascent to the water is another reason for air extravasations into extrapulmonary structures <sup>(7)</sup>.

Even though they are typically asymptomatic, pneumomediastinum and pneumopericardium can cause neck and chest pain, dysphonia, and shortness of breath. Treatment is supportive unless the patient has a history of trauma from aspirating a foreign body. The course of spontaneous pneumomediastinum and pneumopericardium is typically benign and self-limited <sup>(8, 9)</sup>.

Making a diagnosis of SPM only requires the sudden start of the characteristic symptoms, the presence of a predisposing condition, and the use of CT to rule out any other potential causes of pneumomediastinum. SPM should be taken into consideration after excluding out common illnesses when a youngster complains of chest pain or tightness. Clinical characteristics and a chest CT scan can be used to diagnose SPM. Clinical characteristics and a chest CT scan can be used to diagnose SPM; this entity does not require surgical intervention to be treated. The evolution is generally benign, which justifies a cautious approach <sup>(10, 11, 12)</sup>.

#### 4. Conclusions

Spontaneous subcutaneous emphysema and pneumomediastinum are rare presentations in Asthmatic patients. This entity is usually treated with conservative treatment like control acute asthmatic control oxygen therapy, and most of the time, it responds to conservative therapy without any surgical intervention.

#### Conflict of Interest

The authors declare that they have no competing interest

#### Ethical approval

I certify that the study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. The ethical board of Adama Hospital Medical College exempts the study from ethical approval in our institution. The patient gave written informed consent to publish this case report and accompanying images. A copy of the written consent form is available for review by the editor-in-chief of this journal upon request.



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