

## SUBCUTANEOUS EMPHYSEMA ASSOCIATED WITH ASTHMA EXACERBATION

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### Summary

*A 4 year 4 months girl presented with marked respiratory distress, puffiness of the face and neck. She was dyspneic with a respiratory rate 53 breaths/min, subcutaneous swelling and crepitus was felt over the neck, shoulder and chest. Chest examination revealed bilateral polyphonic rhonchi and the chest radiograph showed areas of lucency over the neck and both the anterior and posterior chest walls. A diagnosis of moderate exacerbation of asthma complicated with subcutaneous emphysema was made and the patient was managed conservatively with nebulized salbutamol, steroids, oxygen and antibiotic. She made a remarkable improvement and has remained in a stable clinical condition.*

**Key words:** Asthma; Subcutaneous emphysema; Conservative management.

### Introduction

Asthma is defined as a disorder characterized by chronic airway inflammation and increased airway responsiveness to allergen resulting in symptoms of wheeze, cough, chest tightness and dyspnoea [1]. Subcutaneous emphysema is presence of gas or air in the layer under the skin. Subcutaneous refers to the tissue beneath the skin, and emphysema refers to trapped air. Since the air generally comes from the chest cavity,

subcutaneous emphysema usually occurs on the chest, neck and face, where it is able to travel from the chest cavity along the fascia [2]. While the pneumomediastinum otherwise known as mediastinal emphysema refers to the presence of air within the mediastinum. Pneumomediastinum (air in the mediastinum) was first described as a complication of trauma in 1819 by Laennec [3]. Both conditions are relatively uncommon but important complications of bronchial asthma. The first definitive case of asthma complicated by subcutaneous emphysema was reported in a child in 1850 [3]. A number of cases have since been reported but an understanding of the underlying pathology of the condition was not elucidated until 1939 [3]. Though asthma is a commonly occurring disease, the combination of asthma with subcutaneous emphysema and pneumomediastinum without pneumothorax is very rare [4].

Here we report a case of subcutaneous emphysema complicating asthma with a view to highlight the occurrence of this rare complication of bronchial asthma in our environment. The pathophysiologic mechanisms and treatment approach are also reviewed in the light of current literature.

### Case Report

A 4 years 4 months immunized girl of non consanguineous parents belongs to a middle class family hailing from Firozshah colony, Pahartoli, Chittagong admitted in Pediatric Department, University of Science & Technology Chittagong (USTC) with cough and suddenly developing difficulty in breathing for 1 day for which baby was unable to talk in sentences. Immediately after hospitalization she was treated with oxygen inhalation, nebulization with salbutamol injection hydrocortisone and i.v antibiotics. Previously she had two similar attack, 1st at the age of 3 month and 2nd at the age of 1 year and both required hospitalization.

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Besides these two acute exacerbation she suffered from few nocturnal symptoms 3-4 months interval, last symptom appeared 15 days back and needed to be nebulized. But in between she was symptom free. After 1 day of admission she developed swelling of the face extended upto the neck which increase the severity of difficulty in breathing. Drug history revealed that she had taken salbutamol inhaler when symptom appeared. One of her elder sister also has same disease. She had no responsive to any known allergen. On examination she was dyspneic and had subcutaneous swelling and crepitus over the neck, anterior and posterior chest regions, bilateral and polyphonic rhonchi with prolonged expiratory phase. The baby was restless, not cyanosed. She had a respiratory rate of 53 breaths per minute, pulse rate of 130 beats per minutes and blood pressure of 80 / 50 mmHg, spo<sub>2</sub> 91%. Examination of other systems was essentially normal. Laboratory findings showed Hb- 10.5 gm/dl, ESR-10 mm in1st hr, White Blood Cell (WBC) count of 9,000 cells/mm<sup>3</sup> with 79% polymorphonuclear neutrophils, 17% lymphocytes and 2% eosinophils, 2% monocyte, platelet count 2,80,000/cmm of blood. ABG analysis showed PH: 7.442, PCO<sub>2</sub>: 30.5 mm of Hg, PO<sub>2</sub>: 52.1 mm of Hg, HCO<sub>3</sub>: 20.5 mmol/L, BE: -2.9. S Electrolyte and Electrocardiogram (ECG) were normal. The chest radiograph showed areas of lucency over the neck and both the anterior and posterior chest walls. ( Fig 1)

Based on the history, clinical and radiological findings, a diagnosis of moderate acute exacerbation of intermittent asthma with subcutaneous emphysema was made. The treatment given accordingly. She made remarkable clinical and radiological improvement (Fig 2) with resolution of the initial symptoms and signs. He was subsequently discharged after 6 days of treatment and has remained in a stable clinical condition in follow up visits.



**Fig 1 :** Plain chest radiograph demonstrating extensive subcutaneous emphysema extending from neck to chest wall



**Fig 2 :** Plain chest radiograph demonstrating disappearance of air after 5 days of conservative management

**Discussion**

Subcutaneous emphysema is a rare complication of acute severe asthma, may occur in association with spontaneous pneumomediastinum, pneumopericardium or pneumoperitoneum. Spontaneous subcutaneous emphysema results from the rupture of marginal alveoli and subsequent tracking of air along bronchi, interstitial and vascular supportive tissues into the mediastinum. The air may then get to the pleural, pericardial, peritoneal space or the soft tissues of the face, neck or upper trunk causing subcutaneous cervico-facial emphysema. This escape of air out of the alveolar spaces results in ventilation-perfusion mismatch and consequent abnormality of oxygenation of arterial blood [4]. Other causes of extravasations of air into extra-pulmonary structures include puncture of parts of the respiratory or gastrointestinal systems. Particularly in the chest and neck, air may become trapped as a result of penetrating trauma (e.g. Gunshot wounds or stab wounds) or blunt trauma. Infection (e.g Gas gangrene) can cause gas to be trapped in the subcutaneous tissues. Subcutaneous emphysema can be caused by medical procedures and medical conditions that cause the pressure in the alveoli of the lung to be higher than that in the tissues outside them [5]. Its most common causes are pneumothorax and a chest tube that has become occluded by a blood clot or fibrinous material. Some rare conditions like asthma, valsalva manouver, cough, emesis, barotraumas can cause subcutaneous emphysema. Signs and symptoms of spontaneous subcutaneous emphysema vary according to cause, but it is often associated with swelling of the neck and chest pain. It may also cause sore throat, neck pain, difficulty in swallowing, wheezing and difficulty in breathing. Chest X-rays may show air in the mediastinum, the middle of the chest cavity. A significant case of subcutaneous emphysema is easy to detect by touching the overlying skin, it feels like tissue paper or Rice Krispies [6]. Touching the bubbles causes them to move and sometimes make a crackling noise [7]. The air bubbles, which are painless and feel like small nodules to the touch, may burst when the skin above them is palpated [7]. The tissues surrounding subcutaneous emphysema are usually swollen. When large volume of air leak into the tissues, the face can swell considerably [6].

In cases of subcutaneous emphysema around the neck, there may be a feeling of fullness in the neck, and the sound of the voice may change [8]. If subcutaneous emphysema is particularly extreme around the neck and chest, the swelling can interfere breathing. This air can travel to many parts of the body, including the abdomen and limbs, because there are no separations in the fatty tissue in the skin to prevent the air from moving [9].

Subcutaneous emphysema is usually benign [2]. Most of the time, SCE itself does not need treatment, however, if the volume of air is large, it can interfere with breathing and be uncomfortable [10]. Severe cases can compress the trachea and require treatment.

In severe cases of subcutaneous emphysema, catheters can be placed in the subcutaneous tissue to release the air [2]. Small cuts, or "Blow holes", may be made in the skin to release the gas. When subcutaneous emphysema occurs due to pneumothorax, a chest tube is frequently used to control the latter; this eliminates the source of the air entering the subcutaneous space [2].

In this patient, there were clinical and radiological evidences of for the subcutaneous emphysema. Since treatment usually involves dealing with the underlying condition, cases of spontaneous subcutaneous emphysema may require nothing more than bed rest, medication to control pain, and perhaps supplemental oxygen [5]. Breathing oxygen may help the body to absorb the subcutaneous air more quickly [10]. Reassurance and observation are also part of treatment.

**Conclusion**

In this case, extra-pulmonary accumulation of air manifested as subcutaneous emphysema. This constitutes a rare but very important complication of acute exacerbation of bronchial asthma which is amenable to conservative management. This case report raises awareness of its occurrence to induce a high index of suspicion. Appropriate management by monitoring with pulse oxymeter help avoid invasive procedure to release the air. It can also detect the deterioration of the condition and helps early intervention thus minimizing the complications.

**Disclosure**

All the authors declared no competing interest.

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