Case Report

A Rare Case of Completely Healed Pneumomediastinum Due to Asthma Exacerbation in A Young Male Patient

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Submitted: June 14th, 2023
Accepted: August 28th, 2023
Published: February 28th, 2024

Respir Sci. 2024; 4(2): 139-147
https://doi.org/10.36497/respirsci.v4i2.95

Abstract

Background: The term pneumomediastinum (PNM) refers to the presence of air within the mediastinal cavity. This illness is uncommon but can arise in adolescents with severe asthma attacks. In children aged 5 to 34, the incidence of pneumomediastinum after an acute asthma attack is 1 in 25,000. Men made up the majority of patients (76 percent of all cases). Pneumomediastinum can be diagnosed with the assistance of a chest CT scan.

Case: A young man was diagnosed with pneumomediastinum due to an acute asthma attack in this case report. Symptoms of uncontrolled asthma include shortness of breath that worsens with wheezing, chest tightness, and a nonproductive cough. Since the age of 12, the patient in this instance has been receiving salbutamol inhalers. The physical examination revealed polyphonic lung respiration and subcutaneous crepitus in the neck, shoulders, and anterior chest. With adequate management of an asthma episode, pneumomediastinum recovers spontaneously, followed by recurrent symptomatic status, physical examination, and radiography examination.

Discussion: Acute asthma exacerbations are one of the factors that can lead to spontaneous pneumomediastinum, in which mediastinal air can permeate the tissue and generate a pneumothorax, and if there is air in the subcutaneous area, it can lead to subcutaneous emphysema.

Conclusion: Pneumomediastinum was a rare incidence, pulmonologists examining young adults with acute asthma exacerbations should evaluate for pneumomediastinum. In usual asthma therapy, a chest CT-scan is essential to screen for pneumomediastinum.

Keywords: asthma attack, chest CT-scan, secondary pneumomediastinum

INTRODUCTION

A morbidly obese young man was brought to the emergency room of Haji Adam Malik General Hospital due to asthma exacerbation and pneumomediastinum. This page describes the case, how to spot the symptoms, and how to decide the diagnosis and therapy.

Another word for the presence of air in the mediastinum is pneumomediastinum.[1,2] Pneumomediastinum is a rare disorder that occurs in 1/100,000 spontaneous births or 1/44,500 emergency department visits, with a higher incidence in children (1/800-1/15,500). Others predict a prevalence of 1 in 25.000 among individuals aged 5 to 34. The overwhelming majority of patients are male (76% of all cases). Multiple physicians have discovered that pneumomediastinum is more prevalent than previously believed as a result of underdiagnosis.

If a causal factor is identified, the mediastinal air is categorized as secondary pneumomediastinum. Pneumomediastinum can be induced by respiratory disorders, particularly asthma or upper respiratory infection exacerbations accompanied by a severe cough. Common risk factors include asthma, interstitial lung disease, COPD, bronchitis, lung cysts, lung cancer, frequent vomiting, and trauma (including iatrogenic diseases). Other drugs, including cocaine, marijuana, and methamphetamine, have been linked to pneumomediastinum in recent years.[2–5]

Spontaneous pneumomediastinum (SPM) (Figure 1) is the introduction of air into the mediastinum of otherwise healthy individuals in the absence of a definite reason, such as surgery, air following perforation, infection, or trauma.[1]

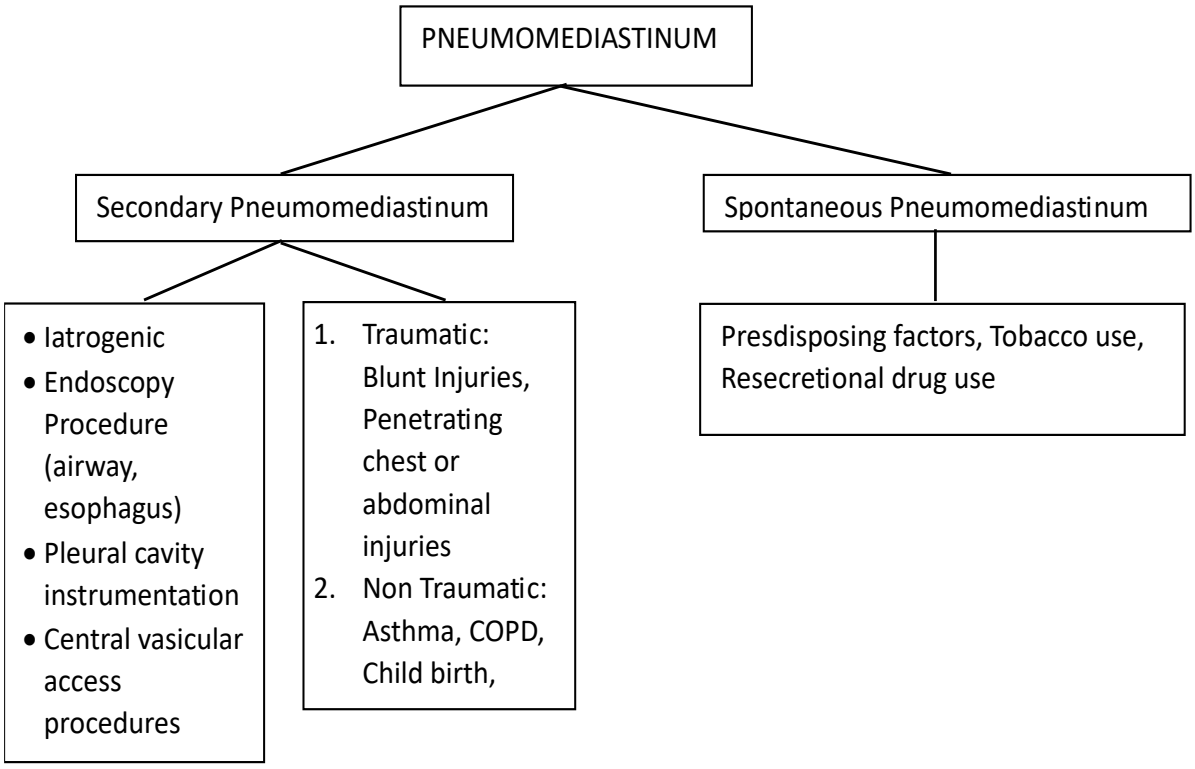

Figure 1. Classification of pneumomediastinum

Air in the mediastinum is also considered spontaneous if mechanical ventilation or the Valsalva maneuver are not employed. This phenomenon is observed in a significant proportion of persons for whom the source of pneumomediastinum cannot be determined.[6]

Pneumomediastinum is also induced by a difficult valsalva maneuver, delivery, rapid ascent during diving, foreign bodies entering the airway and lungs, anorexia, sporting activities, and inhaling toxic fumes. Despite the identification of a possible causative factor, multiple investigations have enabled the usage of the broader term SPM.[1,6] The lack of clarity has caused debate among authors, as it is obvious that secondary pneumomediastinum is more common than SPM.

The first Pneumomediastinum reports date back to 1819 by Laennec, who described this condition as secondary to trauma.[1–3] Hamman described a postpartum patient with subcutaneous emphysema and pneumomediastinum, a condition that is now known as the Hamman syndrome.[6–8]

A sudden increase in intrathoracic pressure results in an increased intra-alveolar pressure, leading to alveolar rupture, with leakage of air along mediastinal planes. Hamman further described the crepitus heard with the heartbeat on chest auscultation, the pathognomonic sign of spontaneous pneumomediastinum, known as Hamman's sign. Spontaneous pneumomediastinum is mostly seen in young male patients. Several cases of pneumomediastinum in asthma attack have been reported.[6–8]

An abnormal increase in pressure in the mediastinum, which, like the pleural cavity, is susceptible to low and negative pressure, causing air dissection between the mediastinal structures that support the mediastinum, is also a possible cause of pneumomediastinum. A sudden decrease in intravascular pressure can also result in a pressure gradient in the perivascular regions.[1]

By means of loose alveolar fatty tissue in the neck, upper abdomen, or skin, air can escape (subcutaneous emphysema). Air can also enter the pleura and peritoneum, leading to pneumothorax and pneumoperitoneum, respectively.[9]

Acute asthma exacerbations are one of the factors that can lead to spontaneous pneumomediastinum, in which mediastinal air can permeate the tissue and generate a pneumothorax, and if there is air in the subcutaneous area, it can lead to subcutaneous emphysema.[10] Severe asthma exacerbations are life-threatening medical crises, and aggravating conditions such as pneumomediastinum must be assessed during a physical exam.[11]

Management of asthma exacerbations and pneumomediastinum consequences consists of proper management of asthma exacerbations followed by re-evaluation of symptom status and physical inspection of any pneumomediastinum abnormalities. Upon resolution of an asthma exacerbation, the pneumomediastinum often vanishes.[4]

CASE

A 29-year-old male with an overweight BMI was referred to the emergency room of Haji Adam Malik General Hospital due to asthma exacerbation characterized by increased shortness of breath (SOB), wheezing, chest tightness, and a non-productive cough. His asthma was not under control.

This patient, who has suffered from asthma since the age of 12, regularly used a salbutamol inhaler. He asserted that he had never been reviewed by a physician because the problem was always use a salbutamol inhaler. Since childhood, he has occasionally experienced shortness of breath, which was triggered by household dust, cigarette smoke, car exhaust, and fatigue.

In the last two weeks, there have also been reports of coughing and drying up of mucus. No cases of fever were detected. No night sweats were found. There is an asthmatic grandmother in the family. He has been exposed to dust and cigarette smoke as a contractor (rental of musical instruments) for the previous five years. Patient frequently experiences shortness of breath, which hinders activities and sleep, and wakes up 1-2 times a week at night due to shortness of breath.

The patient was hemodynamically stable, conscious, had a blood pressure of 110/70 mmHg, heart rate of 112 bpm, respiratory rate of 32, normal temperature, room air oxygen saturation of 92%, and a nasal oxygen saturation of 97% at 4 lpm.

On examination, he was tall, obese, alert, oriented, and talked in coherent phrases. His BMI was greater than 25. The examination of the patient's respiratory system indicated polyphonic breathing in both lungs and crepitations in the neck, shoulder, and anterior chest.

Figure 1. (a) Day 1 ER. b) Day 7 in the ward. c) Day 9 in the ward. Resolving the clinical appearance of facial and neck edema seen in clinical examination

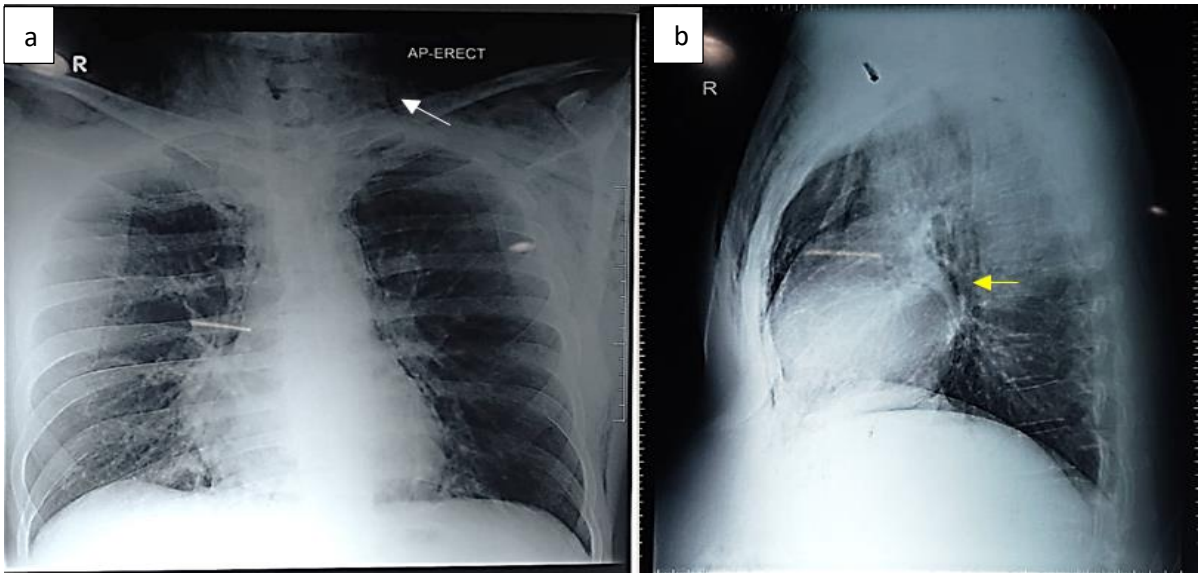

Figure 2a. Subcutaneous emphysema (white arrow) in the neck and supraclavicular region; and 2b. Free air in the mediastinum (yellow arrow)

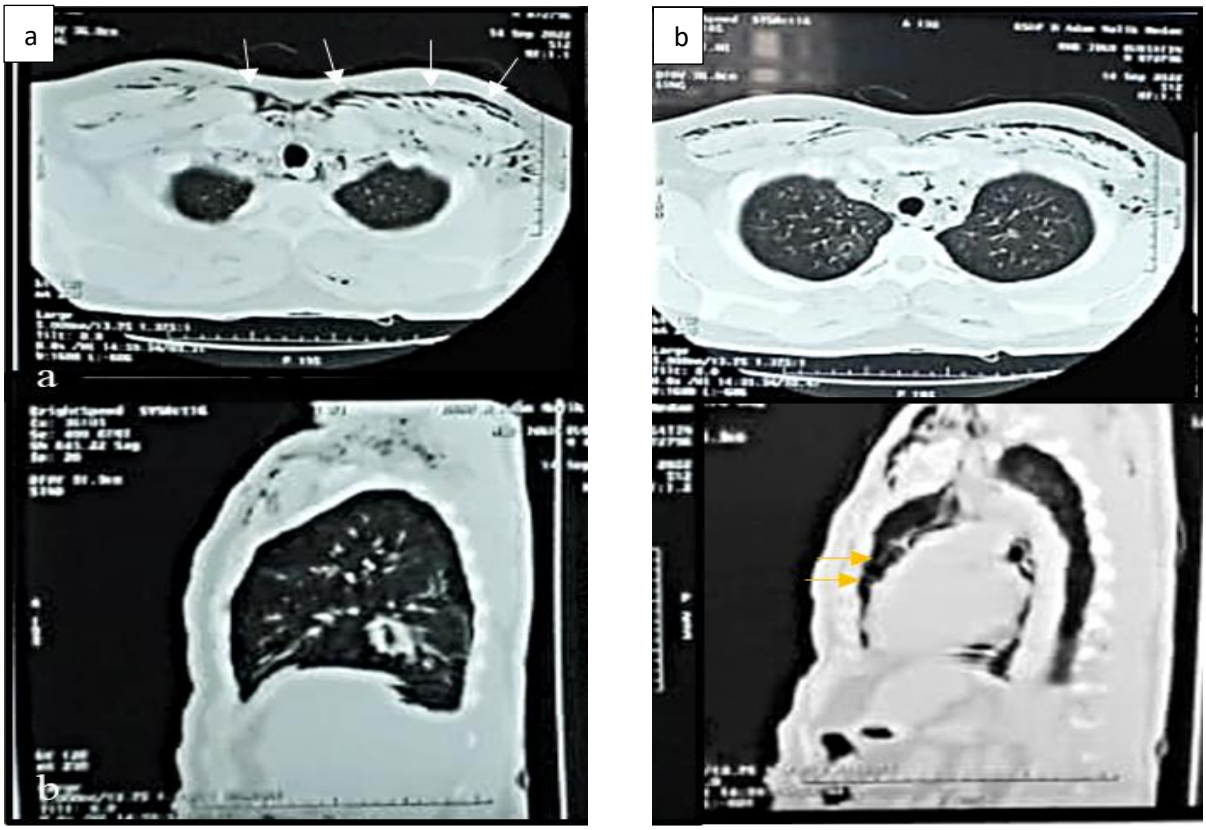

Figure 3. Thoracic computed tomography (CT) (a) axial view and (b) sagittal view.
Subcutaneous emphysema extending to the neck and chest wall (white arrow) and free air in the anterior part of the mediastinum (yellow arrow) where pneumomediastinum was confirmed and pneumothorax was excluded.

The patient was nebulized with salbutamol in the emergency department, and the blockage was treated with inhaled salbutamol 2.5 mg and budesonide 1 mg every 20 minutes for 1 hour. Salbutamol 2.5 mg for 8 hours and budesonide 0.5 mg for 12 hours were continued concurrently.

The blood count revealed a predominance of neutrophils, normal eosinophils, normal electrolytes, and high

IgE, with a total IgE level of 389.2 (the normal range was less than 100). The EKG revealed a sinus rhythm. The arterial blood gases in the chamber demonstrated uncompensated respiratory acidosis (pH=7.33; pCO_2=51.0; base excess=0.3; and HCO_3=26.9).

Chest radiography (Figure 2) revealed normal lungs with air in the mediastinum and no pleural lines, devoid of bilateral supraclavicular subcutaneous emphysema and pneumomediastinum. On a chest CT scan (Figure 3), the images of the mandible, colli, supraclavicular, and right and left anterior chest wall s were different. The description also showed the extent of the surrounding environment. No consolidations, nodules, or masses were observed in either lung; the mediastinum had a healthy appearance.

There are an improvement of CO_2 collection in the BGA series two days after treatment of respiratory acidosis. The IgE test revealed a total of 389.2.

This patient was subjected to a radiological examination, which pointed out pneumomediastinum and subcutaneous emphysema (Figures 2a and b). From there, PFT was also carried out with spirometry results: FEV_1/FVC=50.27; FEV_1=21.7 percent of prediction, FEF_{25-75}=10.3, and the conclusion was: airway obstruction due to asthma exacerbation was observed, characterized by severe obstruction with moderate restrictive disorders and small airway obstruction.

Serial CXR was performed after eight days of treatment. The patient was discharged home eight days after the subcutaneous emphysema appeared to improve. He received treatment for asthma exacerbation, hypoxia, and bronchodilator nebulization. In the emergency room, he underwent needle decompression of the front of his chest. Six days later, a CXR resulted in complete healing (Figure 3).

DISCUSSION

Pneumomediastinum is a rare clinical condition that affects emergency department staff in hospitals. It is also known as "Hamman's syndrome" because Louis Hamman was the first to describe a series of cases with this condition.[1] It is defined by a mediastinum that is intact. The incidence of this condition is less than 1:44000, or approximately 1/25,000 among those aged 5 to 34; the majority of patients (70%) are male.

However, the incidence may be higher due to the fact that many patients do not visit the emergency room or are misdiagnosed, so mild symptoms could be attributed to muscle discomfort or concerns. Pneumomediastinum is a rare consequence of asthma exacerbation, with an incidence between 0.2% and 0.3%. However, if this problem is not discovered and treated promptly, it can have fatal consequences. The potential consequences of tension pneumomediastinum require strict clinical surveillance in the critical care unit.[6,7]

About 25% of people with pneumomediastinum do not experience coughing episodes. The exact pathophysiology is unknown. Asthmatics,

on the other hand, may experience subsequent air freezing due to narrowing of the airways or mucus retention, especially after minimally repeated coughing.[12]

This creates an increase in alveolar pressure, which causes rupture of the alveoli and allows air to enter the interstitial spaces of the lungs. When the mediastinum is removed, the air leakage may persist along the perivascular sheath, resulting in mediastinal emphysema.[12]

Chest CT-scans are becoming increasingly important for diagnosing pneumomediastinum. Vianello from Italy examined 45 consecutive adult patients diagnosed with severe acute aggravation of asthma with probable pneumomediastinum. Pneumomediastinum was observed in five patients (11%); one instance was detected by CXR and four patients were detected solely by chest CT scan.[13]

If all significant causes have been ruled out, the treatment of pneumomediastinum is typically conservative and requires simple sedation, anti-anxiety medications, oxygen, and analgesics.[7,14] Usually, a 24-hour observation requires hospitalization, as in our case. Rarely, compression of large vessels or trachea may require a videothoracotomy or even a thoracotomy. Extensive subcutaneous emphysema necessitates modest surgical procedures, such as a skin incision, a small subcutaneous drain, or even a chest drain. In all circumstances, post-discharge follow-up is recommended.[15,16]

In this scenario, the long-term objective of treatment should be asthma control and prevention of exacerbation. In this example, there were both clinical and radiographic indications of subcutaneous emphysema, but solely radiographic indications of pneumomediastinum. When supportive care is provided and effective asthma control is achieved, this patient's symptoms and clinical presentation will improve within a few days.

A case described by Ojeda et al suggested that asthma and tracheal diverticulum might have a role in the etiology of pneumomediastinum. We recommend including latent pneumothorax in the differential diagnosis for patients with an acute asthma attack who did not respond to standard treatment.[15] Subcutaneous emphysema is a disorder characterized by the presence of air in the tissue beneath the skin.[9]

As a result of chest compressions, massive air collection can be life-threatening, resulting in progressive hypoxemia and hypercapnia. Other complications of pneumomediastinum include substantial subcutaneous emphysema or pneumothorax, which frequently necessitate minimal treatment, such as a skin incisions and chest tube drainage. Air can also be cut off in the rear of the pharynx and peritoneum, producing pain and difficulty breathing. Rarely, air can escape between the mediastinum and the upper spine, resulting in the formation of a bronchus (free air in the spinal canal).[9,16]

CONCLUSION

A young man was diagnosed with pneumomediastinum due to an asthma episode. Although this was a rare incidence, pulmonologists examining young adults with acute asthma exacerbations should evaluate for pneumomediastinum. In usual asthma therapy, a chest CT-scan is essential to screen for pneumomediastinum and rule out other probable causes of pneumomediastinum. Requirements include conservative treatment and treatment of the underlying condition, along with routine monitoring and follow-up. Early detection can prevent subsequent complications and result in a positive prognosis.

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