



Case Report

Spontaneous Pneumomediastinum – a Rare Asthma Complication

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Abstract

Asthma is the most common chronic respiratory disease worldwide and its prevalence is increasing. Acute asthma complications are often the reason for admission to emergency healthcare service. In our article we present a case of a rare asthma complication – spontaneous pneumomediastinum with a short review of its incidence, etiology, diagnosis and management. Spontaneous pneumothorax is important to differentiate with secondary pneumomediastinum as well as other conditions as cardiac diseases (acute coronary syndrome, pericarditis, cardiac tamponade, pneumopericardium), lung diseases (pneumothorax, pulmonary embolism, tracheobronchial tree rupture), musculoskeletal disorders, and diseases of the esophagus (rupture and perforation of the esophagus). A chest X-ray is often reliable for diagnosis of spontaneous pneumomediastinum and when inconclusive, can be followed by CT. The management is usually conservative with oxygen and analgesia. Surgery is required only in cases of tracheobronchial compression.

Key words:

spontaneous pneumomediastinum, secondary pneumomediastinum, asthma

INTRODUCTION

Asthma is the most common chronic respiratory disease worldwide and its prevalence is increasing.¹ It is also associated with multiple comorbidities and can cause acute complications.² Acute asthma complications are often the reason for admission to emergency healthcare service. Nevertheless, there are also rare complications of asthma such as spontaneous pneumomediastinum, which is often difficult to diagnose.

The pneumomediastinum (also known as mediastinal emphysema) is an abnormal presence of air or other gas in the mediastinum. It was originally described by Rene Laennec in 1819.^{3,4} The term spontaneous was introduced

by Hamman later in 1939.⁵ The condition can result from an injury that leads to air leakage into the mediastinum from the lungs. The term spontaneous indicates that it is encountered in patients with underlying lung diseases or without any medically relevant conditions as compared to that secondary pneumothorax that results from trauma. The incidence of this condition is 1:320 patients in thoracic surgical departments.⁶ It is rarely seen in emergency department settings (1:29,670-1:44,511 emergency hospital admissions).^{7,8}

In our article, we present a case of spontaneous pneumomediastinum in an asthma patient with a brief review of its incidence, etiology, diagnosis and management.

CASE REPORT

A 20-year-old male patient presented to the emergency department with chest pain, productive cough, hoarseness and neck edema. The symptoms started during an asthma attack accompanied with dyspnea and cough. Due to the increase in symptoms, the relatives called an ambulance and he was admitted to the hospital. The patient was diagnosed with asthma at the age of 7 and at the point of admission he was receiving fluticasone propionate 500 mcg/salmeterol 50 mcg



Figure 1. Chest X-ray of the patient. Red arrow – subcutaneous emphysema, white arrows – pneumomediastinum.

2 times per day and salbutamol in case of asthma attacks (1 asthma attack per day), which defines his asthma as uncontrolled. During physical examination, the patient had pale skin, hoarseness, dyspnea, subcutaneous emphysema in the region of upper chest and neck. On auscultation the respiration was normal. The patient was admitted with a pulse of 76 beats per minute and arterial pressure 120/60 mm Hg. The other organ examination was unremarkable. The laboratory analysis revealed a minor leukocytosis (10×10^9 per liter). The chest X-ray revealed the presence of air in the mediastinum and subcutaneously (Figs 1, 2).

A control HRCT was performed with 1.5 mm thickness. The air was distributed subcutaneously and intermuscularly in the soft tissues of the neck, extending along the esophagus and was found in all parts of the mediastinum (Fig. 3). A small amount of air was found subcutaneously and intermuscularly in the chest, mainly in the left axillary region. Furthermore, air was found in the lumen of the spinal canal all the way from the cervical to the lower thoracic region. The lungs had no focal or infiltrative changes. The trachea and bronchi (including subsegmental branches) were clear with a small enlargement of the thickness of the bronchial wall. The heart was not enlarged, pericardial sheets were not changed, and fluid in pericardial space was not detected. Free fluid in the pleural cavities was not present.

The patient was managed conservatively with oxygen and analgesia (non-steroidal anti-inflammatory drugs, ketorolac in the current case). After 7 days of observation he was discharged without any complains and with significant health status improvement.

DISCUSSIONS

Pneumomediastinum is a rare condition, which requires differential diagnosis with several other diseases.⁶⁻⁸ The

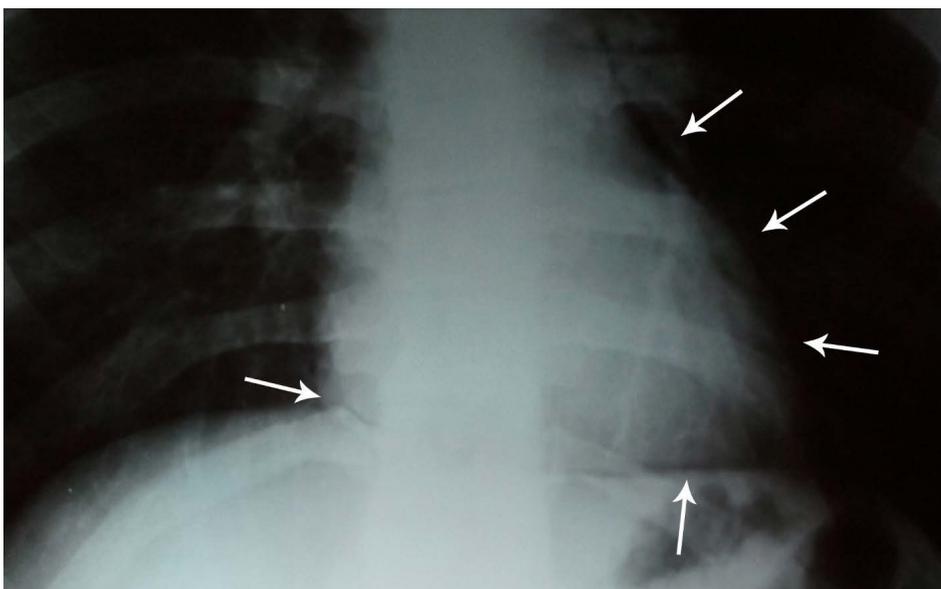


Figure 2. Enlarged region of the mediastinum on the chest X-ray. White arrows – pneumomediastinum.

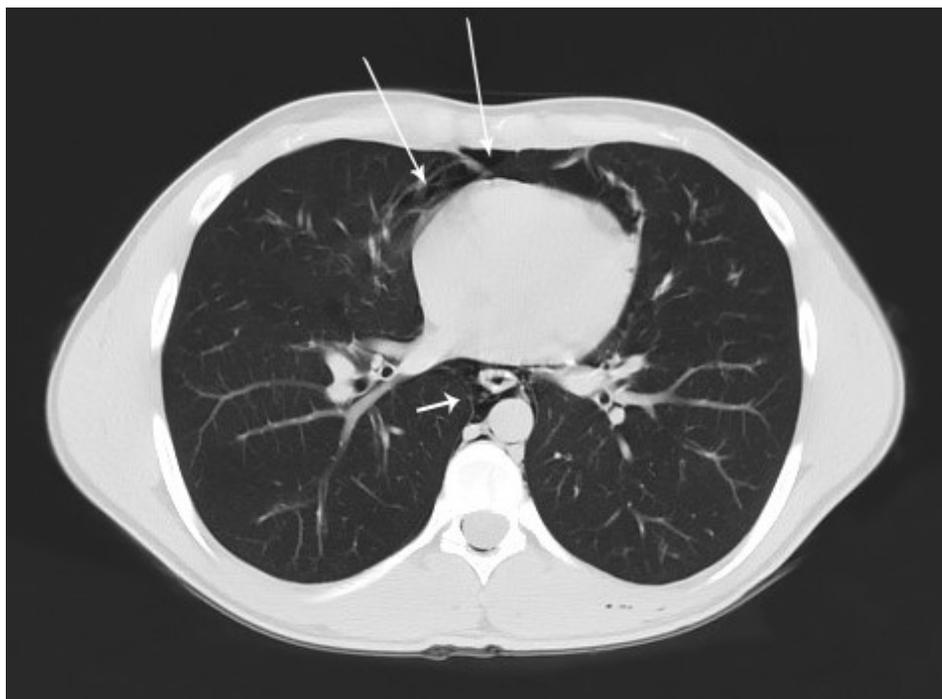


Figure 3. HRCT of the patient. Arrows show area of pneumomediastinum.

condition is more predominant in males (57%–87%).^{7,9} The medical history predisposing to the development of spontaneous pneumomediastinum includes smoking in 29%–34.1% cases, asthma in 14%–21.9%, idiopathic pulmonary fibrosis in 7%, and chronic obstructive pulmonary disease in 4%.⁹ Nevertheless, the condition can be associated with a variety of other diseases including the use of drugs, perforation of the esophagus and even perforation of sigmoid diverticulum.^{7,10} Clinical symptoms include chest pain 54%–59.5%, dyspnea 25.5%–39%, cough 32%–32.5%, subcutaneous emphysema 32%–42.9%, odynophagia 4%, neck swelling 14%, pneumothorax 7%.^{9,11} Hamman's sign (crunching sign over the precordial area synchronous with heartbeats) is present in approximately 20% of patients.¹² In children, cough (81%), dyspnea (75%), and chest pain (56%) are the predominant symptoms and expiratory wheezing (63%) and neck crepitus (50%) are the most common physical findings.¹³ In more than a half of the cases there is no precipitating factors (51.2% of cases). Other common precipitating factors may include physical exercise in 12.2% of cases, vomiting in 9.8%, cough in 7.3%, and infection of the upper airways in 7.3% of cases.⁷

The chest X-ray can reveal pneumomediastinum in 69%–100% of cases and subcutaneous air in 35%–65.8%. The HRCT scan of the chest reveals mediastinal air in practically 100% of cases and subcutaneous air in 40%–100% of the patients. Macklin effect is a pathophysiologic process that is a radiological marker of pneumomediastinum, which consists of alveolar ruptures, air dissection along bronchovascular sheaths, and formation of blunt pulmonary interstitial emphysema.^{7,9,14}

Additional diagnostic methods may include contrast esophagram, esophagoscopy, and bronchoscopy but usually these are not diagnostically accurate. Nevertheless, they may be crucial to exclude other conditions (perforation of the esophagus and/or of the tracheobronchial tree).^{7,9,14}

As compared to spontaneous pneumomediastinum, secondary pneumomediastinum develops as a result of blunt thoracic trauma (39%), barotrauma (33%), *P. carinii* pneumonia (6%), pneumothorax with pulmonary cavitory lesions (6%), esophageal perforation (4%) etc.⁹

It is important to distinguish these two entities since they are different in their clinical outcomes. Cacers et al. compared spontaneous pneumomediastinum patients with secondary pneumomediastinum. Patients with secondary pneumomediastinum were typically older, less likely to be diagnosed using chest X-ray, more likely to have an associated pneumothorax, more likely to have a chest tube placed, to have an associated pleural effusion and have subcutaneous emphysema. As a result, they have a longer hospital stay (19 versus 3 days, $p < 0.001$), and are more likely to have a lethal outcome (39% versus 0%, $p < 0.001$).⁹

The differential diagnosis of spontaneous pneumomediastinum must include several other conditions, in particular, cardiac diseases (acute coronary syndrome, pericarditis, cardiac tamponade, pneumopericardium), lung diseases (pneumothorax, pulmonary embolism, tracheobronchial tree rupture asthma exacerbations, COPD and interstitial lung disease), musculoskeletal disorders, the Valsalva maneuver (e.g. child birth), strenuous exercise, shouting, barotrauma (diving, intubation), cocaine inhalation, and diseases of the esophagus (rupture and perforation of the

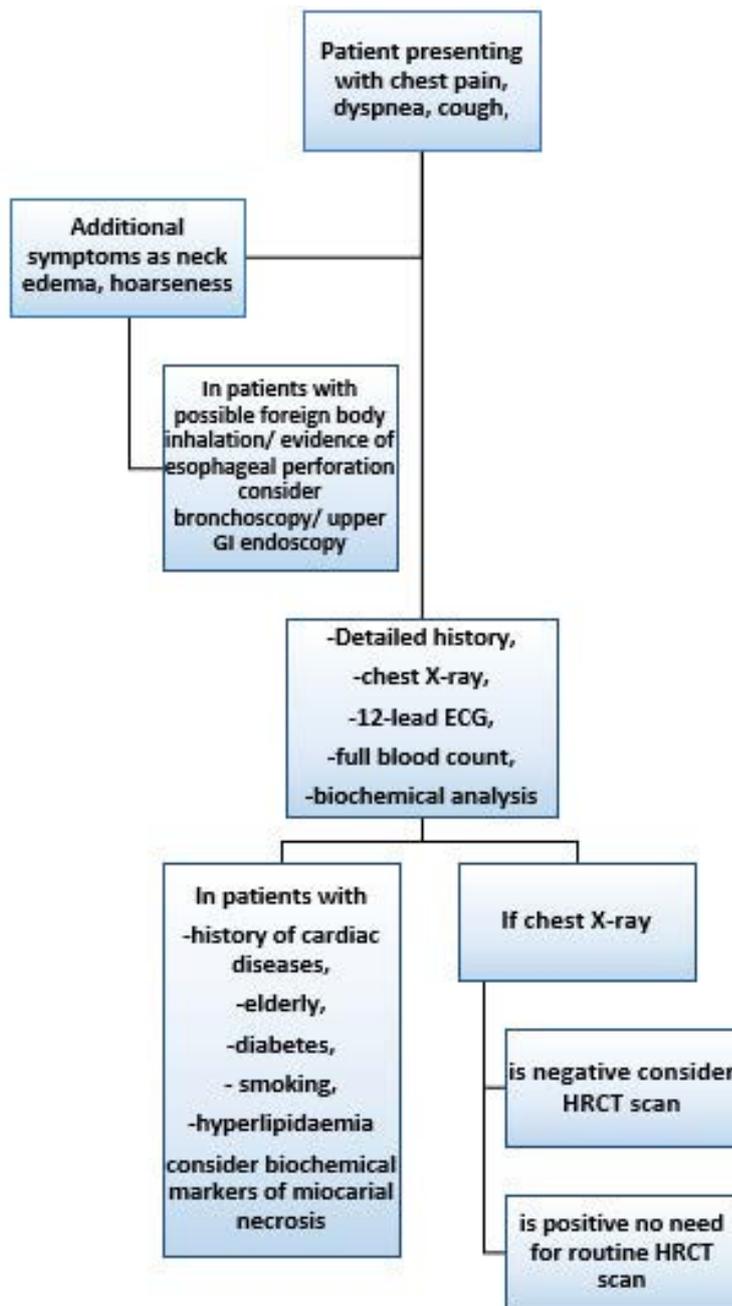


Figure 4. Diagnostic strategy in case of spontaneous pneumomediastinum.

esophagus, Boerhaave syndrome) (Fig. 4).¹⁴

In general, spontaneous pneumomediastinum is a benign condition with a mean duration length of hospitalization of 5 days.⁷ The treatment is conservative and requires analgesia (85.4% of cases), rest (68.3% of cases), and initial oxygen therapy (29.3% of cases). In individual cases, additional treatments may include bronchodilator and antibiotic therapy. Follow-up treatment can be determined individually, based on the clinical picture and chest X-ray.⁷

Nevertheless, thoracic surgeons should also be involved in the diagnosis and treatment of this condition, particu-

larly to exclude emergency and in case of complications. Although it is often benign, there is still the possibility of mediastinal shift and important tracheal compression that would require emergency interventions.^{11,15} In case of compression, there are several procedures for decompression as cutaneous and subcutaneous incisions, needle aspiration, mediastinal catheter application and cervical mediastinotomy. Although cervical mediastinotomy is the most invasive of these, it is also the most effective and reliable method of treatment in case of compression.¹⁶

CONCLUSION

Spontaneous pneumomediastinum is a rare complication that should be taken into account when managing patients with respiratory distress. It is usually seen in patients with underlying respiratory illnesses. The prognosis is favourable and the treatment is symptomatic. Nevertheless, in rare cases patient may require surgical intervention, particularly in case of compression of the trachea or bronchi.

ETHICS

Written informed consent was obtained from the patient for publication of the present study.

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Спонтанный пневмомедиастинум - редкое осложнение астмы

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Астма является наиболее распространённым хроническим респираторным заболеванием во всём мире и его частота увеличивается. Острые осложнения астмы являются частой причиной поступления в отделение неотложной помощи. В настоящей статье мы представляем редкий случай осложнения астмо-спонтанного пневмомедиастинума с кратким обзором его частоты, этиологии, диагностики и лечения. Спонтанный пневмоторакс следует отличать от вторичного псевдомедиастинума, а также от других заболеваний сердца (острый коронарный синдром, перикардит, тампонада сердца, пневмоперикард), заболеваний лёгких (пневмоторакс, тромбоэмболия лёгочной артерии, разрыв трахеобронхиального дерева), нарушений скелетных мышц и заболеваний пищевода (разрыв и перфорация пищевода). Рентгенография грудной клетки является достаточно надёжным средством для диагностики спонтанного псевдомедиастинума, а в случае если не позволяет сделать заключение, за ней может следовать компьютерная томография. Обычно применяется консервативная терапия - с кислородом и обезболиванием. Операция требуется только в случаях трахеобронхиального сжатия.