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Spontaneous pneumomediastinum: Case presentation to a college student health clinic

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ABSTRACT

The author describes a case of spontaneous pneumomediastinum (SPM) in a 19-year-old man presenting to a college student health clinic. The author also provides a review on SPM, including clinical manifestations, diagnostic evaluation, and management.

ARTICLE HISTORY

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shortness of breath;
spontaneous pneumothorax

Report of case

A 19-year-old male student presented to our clinic complaining of sharp left chest pain aggravated by inspiration and accompanied by shortness of breath. The student reported that the duration of the chest pain was 12–15 hours and that for 24 hours, he had been experiencing nasal congestion, sore throat, and a mild cough. He did not recall a fever.

On presentation, he was afebrile with a blood pressure of 119/65 mm Hg and a respiratory rate of 18 breaths per minute. His room air pulse oximetry was 98%. The initial pulse rate of the patient was 101 beats per minute and 96 beats per minute when measured again later in the visit. The examination was notable for rhinorrhea and mild pharyngeal erythema. There was no crepitation to palpation of the neck and chest wall, but there was mild tenderness involving the left sternal border. Heart sounds were normal with no murmurs or crunching sound heard. His lungs were clear to auscultation bilaterally with no diminished breath sounds appreciated. He had no calf swelling, and Homan's sign was negative. Result of a rapid strep test was negative. A complete blood count with differential (CBCd) showed a mild leukocytosis with a normal differential. A d-Dimer was negative. An EKG did not show any signs of ischemia and did not demonstrate any arrhythmias. A chest X-ray revealed a pneumomediastinum without an accompanying pneumothorax (Figures 1 and 2).

The patient cancelled a planned airline flight for later in the week and was followed up by us as an outpatient. At the follow-up visit the next day, the patient was

feeling much better. He reported he still had mild upper respiratory symptoms and only mild chest discomfort with deep inspiration. A repeat chest X-ray showed a stable pneumomediastinum with a possible trace right apical pneumothorax and minimal left chest wall emphysema. On the third day, the patient was seen again and reported continued improvement in the symptoms including the chest discomfort. Another chest X-ray showed a probable slight decrease in the pneumomediastinum with the possible trace right apical pneumothorax still visible. The patient was scheduled for further follow-up in the student health clinic and a consultation with a pulmonologist was arranged; however, the patient did not show up for any further appointments with either our clinic or with the pulmonologist.

Introduction

Spontaneous pneumomediastinum (SPM) is defined as the presence of free air in the mediastinal cavity.¹ It is a rare condition that occurs primarily in men with an average age of 18–25 and with a frequency of only 0.001–0.01% in all adult inpatients; however, given that SPM often has mild symptoms and is self-limited, many cases likely go undiagnosed.^{2,3} SPM is thought to occur when pressure differences across the alveolar membrane due to rapid increases in airway pressures cause the alveoli to rupture. Air then enters the interstitium and travels via the negative pressure gradient along the pulmonary vasculature to the mediastinum (Macklin effect).^{2,3}

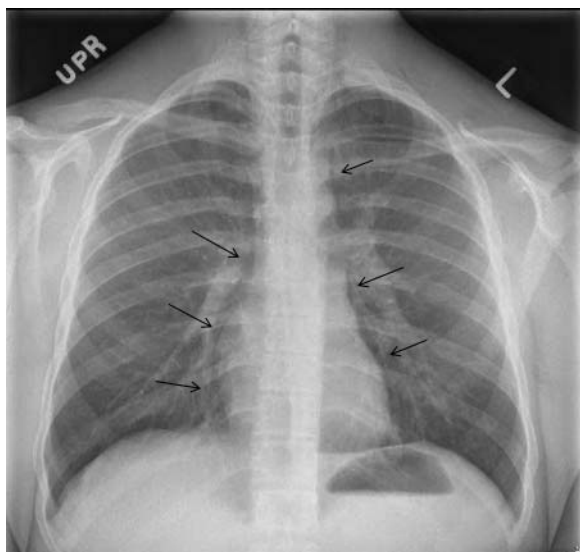


Figure 1. Posterior–anterior view chest X-ray of the patient with spontaneous pneumomediastinum.

Okada et al.⁴ performed a retrospective analysis of 20 patients who presented to a hospital in Tokyo with SPM over a 5-year period. He found causes that included physical exertion such as weightlifting in eight patients, three patients with cough, three patients who sang Karaoke, and two patients with vomiting. There were four patients in whom a cause could not be found. In a retrospective study of 18 patients with SPM who presented to a university hospital in Messina, Italy, Mondello et al.⁵ found that 12 cases were associated with cough attacks related to asthma or acute exacerbations of chronic bronchitis and six cases were related to physical activity.



Figure 2. Lateral view chest X-ray of the patient with spontaneous pneumomediastinum.

Likely from self-induced vomiting, SPM has been reported as a rare complication of anorexia nervosa.⁶

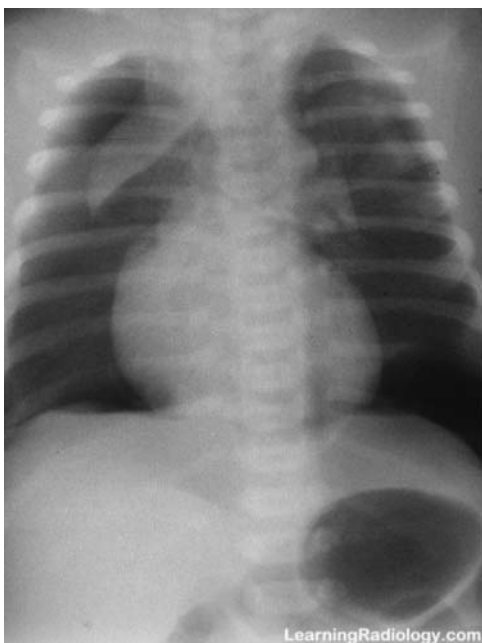
Though SPM is typically benign, it is important to distinguish SPM from secondary pneumomediastinum caused by trauma, gas-producing organisms, and esophageal rupture which are all potentially fatal and require emergency management.⁴ It is also important to distinguish SPM from other potentially serious causes of chest pain and shortness of breath such as pneumothorax, pericarditis, cardiac tamponade, pulmonary embolism, dissecting aortic aneurysm, and acute coronary syndrome.^{2,7}

Clinical manifestations

The most common presenting symptoms of SPM are chest pain and shortness of breath. Often the chest pain is pleuritic and radiates to the neck and back. Other symptoms may include cough, rhinolalia (hypernasal voice), dysphagia, and dysphonia.^{1–4} A common finding on physical examination is subcutaneous emphysema involving the neck and shoulders. Hamman's sign, a crackling sound heard with each heartbeat on auscultation ([https://www.youtube.com/watch?v = mXJHtJeL1mM](https://www.youtube.com/watch?v=mXJHtJeL1mM)), is another common examination finding.^{1–4,7–9} Often the presentation of SPM is vague, with many of the above signs and symptoms lacking. It is estimated that up to 30% of cases of SPM go undiagnosed initially.¹ The presence of vomiting along with chest pain and subcutaneous emphysema (Mackler's triad) should raise the suspicion for esophageal rupture (Boerhaave syndrome) that, even with prompt treatment, can lead to fatal mediastinitis in up to 30–50% of patients.^{2,10}

Diagnosis

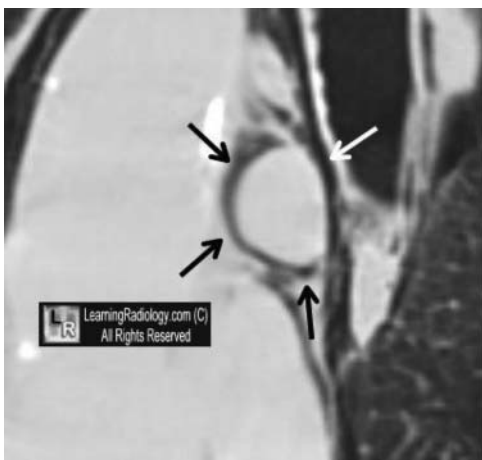
SPM is most often diagnosed by chest X-ray. Common posterior–anterior chest X-ray findings include air streaks in the superior mediastinum, a prominent silhouette of the heart, and subcutaneous emphysema of the shoulder and neck. Primarily in pediatric patients, air can cause elevation of the thymus to produce a “sail sign.” (Example 1) On the lateral view of the chest X-ray, a “ring sign” (Example 2) can be produced by air surrounding the pulmonary artery.^{1,2} In cases where a definitive diagnosis of SPM can be made using chest X-ray, no further imaging is needed; however, if the chest X-ray is nondiagnostic and there is a high index of suspicion then chest computed tomography, which can detect smaller air leaks, or ultrasonography may be used to confirm the diagnosis.^{1,2,4,8} According to one small report, 30% of cases of SPM cannot be seen on a chest X-ray.^{2,4}



Example 1. Thymic “Sail Sign” seen on PA chest x-ray of a pediatric patient Published with permission from LearningRadiology.com.

Management

There are no clear guidelines for the management of SPM. Several authors recommend at least a short hospitalization for close observation to rule out complications such as pneumothorax and mediastinitis from an esophageal rupture.^{2,3,11} In-hospital treatment typically consists of bed rest, the administration of analgesics, and oxygen therapy.^{1,3,7,9} Oxygen therapy is thought to increase the diffusion pressure of nitrogen in the interstitium and promote a more rapid absorption of free air, a so-called “nitrogen



Example 2. “Ring Sign” seen on lateral chest X-ray. © LearningRadiology.com. Reproduced by permission of LearningRadiology.com. Permission to reuse must be obtained from the rightsholder.

washout.” However, the efficacy of oxygen therapy is not conclusive and not all authors recommend its use.^{1,2,9} Treatment may also include empiric antibiotics when there is a concern for mediastinitis.^{1,3,7,9} Some authors argue that hospitalization is only necessary if the diagnosis is in question, if a nonspontaneous pneumomediastinum (PM) (such as from trauma) cannot be ruled out, or if mediastinitis cannot be ruled out.^{4,9} Serial chest X-rays are often used to follow patients with SPM, but they have not been found to be beneficial so long as the patient is clinically improving.^{1,2}

Discussion

SPM is a rare clinical entity that is often missed. Given the typical age range of patients with SPM, the college student health clinic is a likely setting where this condition would be encountered and should be part of the differential diagnosis when patients present with chest pain and shortness of breath. Though most all cases of SPM spontaneously and uneventfully resolve, it is important that an accurate diagnosis be made so that an appropriate follow-up plan is formulated to monitor the patient closely for serious complications such as pneumothorax and mediastinitis.

As was the case with our patient, many college students travel by air for holiday breaks or foreign study. Unfortunately, there are no guidelines in the literature for determining when it is safe to fly after a patient has clinically recovered from SPM; thus, it is wise to consult with a pulmonary specialist to help make that determination. Our patient did cancel his planned flight and, though ultimately lost to follow-up, did not fly in the weeks after his diagnosis as far as we know.

As previously discussed, many authors recommend brief hospitalization for observation when SPM is diagnosed; however, as was the case with our patient, many patients can be observed as an outpatient if they are stable and clinically improving. Special attention should be paid to patients with signs of SPM who are vomiting as this may be a sign of life-threatening esophageal rupture and mediastinitis.¹⁰

Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the Institutional Review Board of Duke University.

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