

Pneumomediastinum: A Case Report

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Introduction

Pneumomediastinum, also known as Mediastinal Emphysema, is defined as having free air or gas located in the mediastinum [2]. Patients have symptoms of emphysema, dysphagia, vomiting, shortness of breath, coughing, and pain in the chest area [4,5]. There are several precipitating factors or etiologies that can

be associated as either intrathoracic/secondary pneumomediastinum or extrathoracic/spontaneous pneumomediastinum shown in figure 1 below.

Spontaneous or secondary pneumomediastinum triggers can range from asthma, use of recreational drugs, excessive vomiting, child-bearing, chest and lung infectious disease, forced

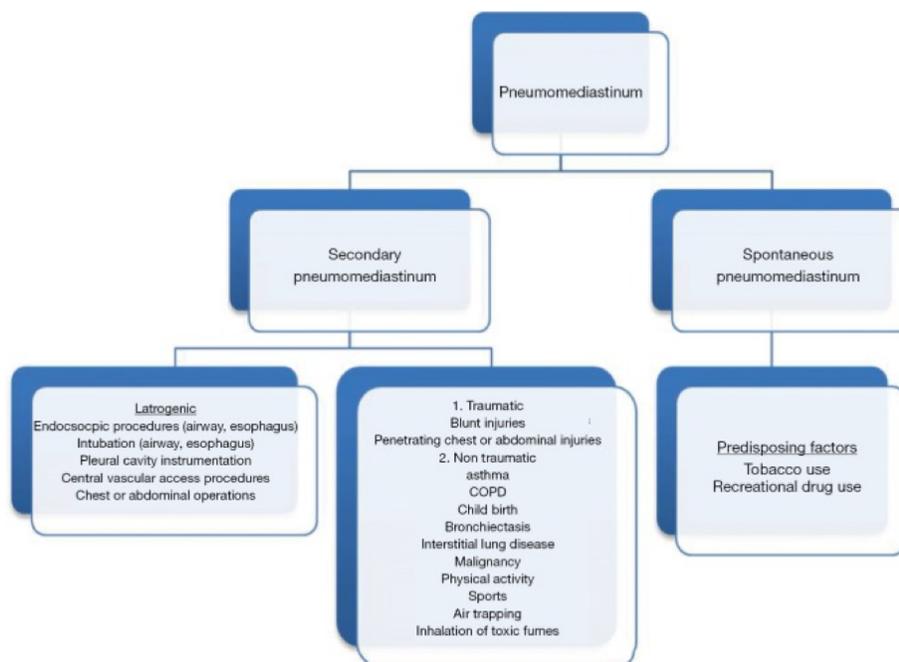


Figure 1. Classification of Pneumomediastinum [3]

pressure to the lungs such as Valsalva maneuver, ruptured alveoli, iatrogenic manipulation during wisdom tooth extractions, and blunt trauma towards the neck and chest area [5,6] .

Spontaneous Pneumomediastinum (SPM) is simply pneumatosis in the mediastinum without any apparent causes, such as blunt trauma to the chest. However, there have been numerous reports of the appearance of Macklin effect on CT images of patients with SPM. It is prevalent in young males and usually benign and self-limiting [1]. SPM is considered to be a rare condition in a small number of patients; therefore, there is a limit to the medical exhibition of SPM due to its benign nature. The prevalence of SPM ranges from 1 of 8,005 to 1 of 42,000 hospital admissions [1].

Case Presentation

The patient is 25 year old Caucasian male with past medical history of asthma was reported to ED on 9/25/18 from Urgent Care after evaluation for shortness of breath and possible pneumomediastinum diagnosed on CXR at Urgent Care. Patient reported of cold-like symptoms for past 3 days associated with nasal congestion, runny nose and vocal distortion. Since yesterday, patient developed dyspnea, worse on supine position, and productive cough with yellow sputum associated with few episodes of non-bloody and non-bilious vomiting. Patient denied any fever, chills, headache, dizziness, neck pain, drooling, chest pain, palpitation, abdominal pain, diarrhea, and back pain. Social history revealed that he

occasionally drinks alcohol and recently started to use marijuana twice a week. Upon further inquiry, the patient was not using any inhalers or medications for his chronic asthma as he was asymptomatic; however, due to his present symptoms, he was given Duoneb and Singulair to treat his probable asthmatic exacerbation. In addition, he was given Phenergan/Codeine for his cough. Furthermore, when asked upon the onset of the symptoms, patient denied any trauma-induced etiologies, which allowed us to rule out Macklin effect secondary to Spontaneous Pneumomediastinum.

Vitals on admission was within normal range except for pulse ox of 94% RA, which was immediately corrected by switching to nasal cannula to increase the oxygenation. On physical exam, heart was regular rhythm, no murmur and no JVD. Respiratory exam showed no decreased breath sounds, no accessory muscle used, no rales, no stridor and wheezing. Chest and Neck CT was ordered and confirmed pneumomediastinum secondary to asthma exacerbation. The patient was given prophylactic Azithromycin and Ceftriaxone for possible pneumonia at ED. Surgical team was consulted in case the pneumomediastinum was secondary to other etiologies. Surgical team ordered another CT in 24 hours to rule out any leaks, Esophagram to rule out esophageal perforation, and Bronchoscopy to rule out ruptured blebs/alveoli in the lungs, which are all serious complications that may cause pneumomediastinum.

On admission day 2, patient's WBC increased from 11 on admission to 15 and

the CT did not show any pleural fluids and pneumothorax, but was consistent with pneumomediastinum. Patient's symptoms improved from taking Duoneb and Singulair, which helped to control his asthmatic symptoms. He no longer complained of shortness of breath, cough and normalization of his voice was noted. On day 3, Esophagram result indicated no gross esophageal laceration or contrast extravasation. Bronchoscopy was negative, but his WBC remained elevated at 14.5. All the cultures for pneumonia and Cryptococcus came out negative. On day 4, he was transferred to the floor after his WBC returned within normal range and from surgical consult perspective, the patient was cleared for discharge post antibiotic treatment. Three days after being on the floor and completion of his antibiotic treatment, he was discharged with a diagnosis of pneumomediastinum secondary to asthma exacerbation and substance usage. The patient was advised to continue his asthma medications and received education on being abstinence from substance use to avoid recurrence. Patient will follow up outpatient with his primary in one week.

Discussion

Pneumomediastinum has been recognized since 1819, when Laennec reported the disease in a case caused by trauma injuries [5]. SPM was further studied in a case series by Hamman in 1939 [5-8]. It is a rare disease with a reported incidence of less than 1:44,000 with lack of proper treatment due to its rarity [5, 7].

Pneumomediastinum can be divided into spontaneous or secondary. Secondary, then, can be further divided into iatrogenic or trauma/non-traumatic induced. In other words, the presence of air in the mediastinum is considered secondary when a causative factor is identified [1]. The diagnosis can be confirmed by chest X-ray or CT of the thorax. Generally, chest CT is more useful than chest X-ray because thin slices are obtained and may reveal other findings that could generate secondary pneumomediastinum [10]. In addition, we ordered an Esophagram and Bronchoscopy to rule out any esophageal perforation and pulmonary etiologies respectively. In recent studies, it showed that many reports did not find any clear benefits of these diagnostic modalities and routine use of these studies should be avoided. Currently, chest CT remains to be the ideal diagnostic tool of choice [2].

In this patient, we were able to quickly isolate the incident of pneumomediastinum as patient presented to ED with symptoms which prompted the use of chest X-ray, later followed by CT to confirm the diagnosis. However, many of the symptoms are nonspecific such as pain, coughing, dyspnea and dysphagia. Therefore, it is crucial to create a differential diagnosis to rule out pulmonary, cardiac, musculoskeletal and esophageal etiologies.

In this patient, the main precipitating factors were the use of illicit drug and asthma. However, in previous reports, precipitating factors were not detected in many cases (30-40%) [9]. The most

remarkable finding of the physical examination is subcutaneous emphysema in many studies [8,9] and Hamman's sign, crackles heard with each beat of the heart, is a well-known auscultative sign of SPM [7,8]. These signs however, were absent in this patient's scenario, but a fever, another common finding, was present in this patient. Nevertheless, the physical examination findings of SPM vary among many reports [6] hence diagnostic imaging is needed to confirm the finding.

There is currently no ideal treatment protocol but bed rest and conservative management such as prophylactic use of analgesics and antibiotics are indicated in patients with SPM. In our patient scenario, we ordered additional antibiotics as we suspected pneumonia. In addition, we gave him supplementary medications for symptom control such as coughing. There is also oxygen therapy called "nitrogen washout", which can accelerate the dissipation of mediastinal gas by increasing the diffusion pressure of nitrogen in interstitium but several papers have reported that this therapy's efficacy is inconclusive [2,10]. The most important non-medical therapy that we prescribed was patient education. We believed that the two main causative factors for SPM in this patient was the use of illicit drug and not using asthma medications. As long as patient stays compliant with the abstinence of drugs and the use of asthmatic medication, SPM should theoretically not resurface. However, recurrences may still occur despite compliance so patient will be carefully managed in outpatient in one week.

Conclusion

Although pneumomediastinum may be a rare and benign disease primarily in young adult males, it can still have an uneventful recovery process once it is present. Once the diagnosis begins and specific treatment or an esophageal or tracheal perforation cannot be ruled out, hospital treatment must be taken account [3]. In order to avoid secondary pneumomediastinum complications, detailed medical history and CT should be taken to isolate and further pinpoint the diagnosis. There are no known ideal treatments for pneumomediastinum, but absolute bed rest and conservative management have been found to be a definite benefit [4]. Ultimately, more research and case studies are warranted to derive effective therapeutic treatment and management to patients with spontaneous or secondary pneumomediastinum.

Reflections from the Primary Author

This research experience has given me a great opportunity to study and write my first case report on a rare medical condition called pneumomediastinum. The patient, who I first encountered in ED during my surgical clerkship, intrigued me. I have never encountered spontaneous pneumomediastinum before and Dr. Gomez, one of the surgical resident, explained to me about the condition and Macklin effect. All the series of imaging and testing were fascinating and the whole structure of ruling out the most serious etiologies was an incredible learning experience. Constantly learning about new diagnoses is what makes medicine the

most exciting career field. I have yet to decide on the specialty of my choice, but I hope to continue to develop the drive and motivation to learn every single day to help me treat my future patients. This case has helped me to expand my medical knowledge and provided an opportunity for me to supplement my knowledge with research and writing skills.

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