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Case report

A peculiar case of asymptomatic spontaneous pneumomediastinum

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ABSTRACT

Objective: To present a case of asymptomatic spontaneous pneumomediastinum and review available evidence-based workup and management.

Case presentation: A young Caucasian adult male with a history of inhalational drug use was admitted to the internal medicine service for evaluation of dehydration and mild rhabdomyolysis. Patient had been on the run from the police and had spent the last days prior to presentation without food, water, or shelter. On admission, patient had no complaints, except for thirst. It was detected on physical exam and chest x-ray that patient had subcutaneous emphysema and pneumomediastinum. The patient was treated conservatively and discharged after a period of observation.

Conclusion: Spontaneous pneumomediastinum is benign and seen primarily in young adults. It is more commonly associated with symptoms like chest pain and/or dyspnea, making an asymptomatic case particularly distinctive. The etiologies and precipitating factors are varied and often an apparent cause isn't identified. The diagnostic approach involves chest x-ray and/or computed tomography (CT) chest with further workup being largely unnecessary. The tenants of management include bedrest, analgesics, and supplemental oxygen as needed.

1. Introduction

Pneumomediastinum is characterized by free air within the mediastinal space. It can be divided into secondary pneumomediastinum in which a cause can be identified (ex. trauma, intrathoracic infection, perforation) and spontaneous pneumomediastinum (SPM) in which a cause cannot be determined [4]. SPM is a rare phenomenon, occurring at an incidence of 0.001%–0.01% in the general population [12]. Because of its rarity, the literature consists primarily of case reports and analyses of retrospective data. A review of this literature was undertaken via PubMed with search terms “spontaneous pneumomediastinum”, “asymptomatic pneumomediastinum”, and “asymptomatic spontaneous pneumomediastinum”.

SPM primarily affects young adults (mean age 22.8 ± 4.64 years) with a male to female ratio of 3:1 [5]. Previous cases illustrate a variety of precipitating factors, including “no apparent cause”, strenuous activity, drug use, vomiting, prolonged shouting, and giving birth. The most common signs and symptoms include chest pain (61%), dyspnea (41%), and subcutaneous emphysema (40.3%), but cough (20%), dysphagia (14%), and Hamman's sign (13.8%) have also been described, among others [5]. SPM is a generally benign entity, which can be managed conservatively in most cases. That being said, one must rule out more serious conditions such as Boerhaave's syndrome or tracheobronchial tree rupture when clinically warranted [10].

As previously stated, SPM is a rare diagnosis, but an asymptomatic presentation is even more unusual [6,7,9]. The purpose of this report is to discuss a case of SPM in a young adult male who presented due to dehydration and mild rhabdomyolysis, and was incidentally found to have mediastinal air.

2. Case presentation

A 29 year old Caucasian male (height: 6 feet, 0 inches, weight: 148 pounds, BMI: 20.1) was brought into the emergency department by authorities for evaluation after being on the run for one week prior to presentation. The patient had kidnapped his two children, for which he shared custody, because he felt that they were in danger. His eldest daughter had supposedly confided that she had been molested by a friend of the mother's, leading the patient to take his daughters out of school and drive out of the state. After days of driving, the patient decided to burn his truck on the side of the road and proceed on foot. He believed authorities would

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find him if he continued in his vehicle, especially as “white and orange planes” had been monitoring him for failing to make his truck payments. He spent five days trekking through the woods with his children without food, water, shelter, or shoes (he had decided to take off his shoes to not “make his daughters feel bad” for having better hiking footwear). Patient eventually concluded that he and his daughters were not going to survive in the woods and so he left them behind to find help. After further hiking, he found an elderly couple who concomitantly helped the patient find his daughters and also alerted authorities. Patient was soon thereafter in custody and transported to the ED.

The patient did not have any complaints in the ED, besides feeling thirsty. He denied fever, chills, chest pain, dyspnea, cough, neck pain or swelling, nausea, vomiting, dysphagia, recent medical procedures or intubations, infections, or trauma. He denied medications, allergies/asthma, past surgeries (including dental surgeries), hospitalizations, or other past medical diagnoses. He had no previous psychiatric history and no significant family medical history. Patient described intermittent tobacco smoking (one cigarette per week), limited social alcohol use, daily marijuana use, and smoking methamphetamine since he was 18 years old (last use was three weeks prior to presentation). He denied history of cocaine or IV drug use. Patient stated that he did exert himself often as a construction worker when lifting bags of concrete and other heavy objects. Review of systems revealed no other findings. Admitting vitals showed Temp. 37.1 °C (98.7 °F), BP 157/88 mmHg, HR 69 bpm, RR 18, and SpO_2 99% (room air). Patient was sunburnt over his face, arms, and lower extremities. Mucous membranes were dry and multiple superficial scratches were seen on his bilateral extremities. As previously implied, patient did express paranoid delusions, but was also attentive, lucid, and cooperative. Physical exam was otherwise insignificant. Labs showed BUN 55 mg/dl, AST 210 U/L, ALT 147 U/L, WBC 13.2 K/μL, CPK 4270 U/L, and a UDS positive for cannabinoids.

Patient was admitted to the hospital floor for dehydration and mild rhabdomyolysis. It was later incidentally detected that he had subcutaneous emphysema and chest x-ray demonstrating pneumo-mediastinum (Fig. 1). CT with and without water-soluble oral contrast were done and demonstrated pneumomediastinum with no signs of esophageal or tracheobronchial defects (Fig. 2). ECG done during workup showed ST/T wave changes suggesting Wellens' sign (Fig. 3a). This finding did not change or progress on repeat ECG (Fig. 3b). Troponins were negative X2 and subsequent echocardiogram showed no abnormalities.

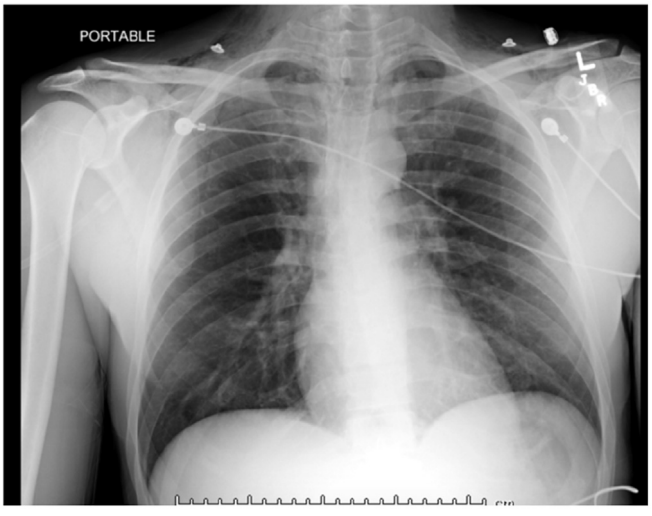

Fig. 1. Chest radiograph showing mediastinal air with extensive subcutaneous gas present.

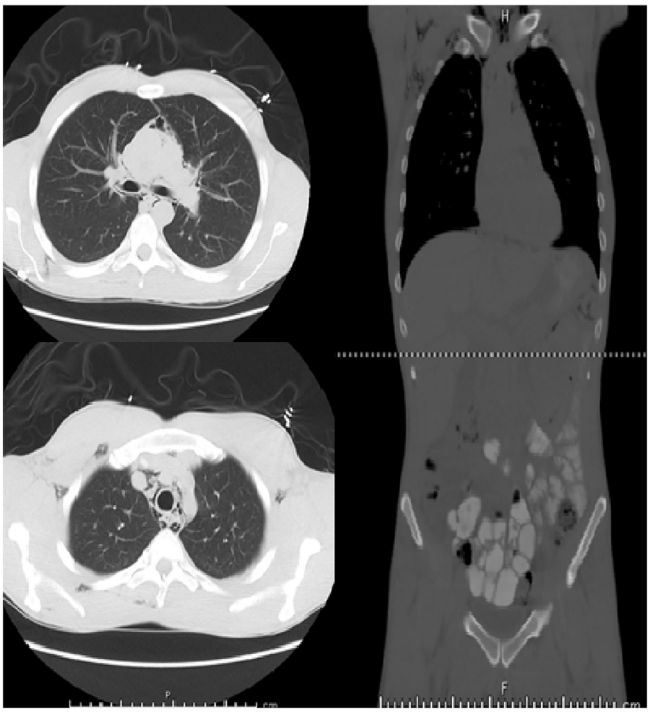

Fig. 2. CT images showing diffuse pneumomediastinum with associated soft tissue gas in the lower neck and upper chest bilaterally.

Throughout hospitalization, patient remained hemodynamically stable without complaints and it was decided that no further intervention was needed to address patient's SPM. He was aggressively treated for dehydration with IV fluids and electrolytes. His CPK, BUN, and transaminases trended downward. Patient's pulse oximetry remained ≥90% throughout hospitalization. Psychiatry service was consulted to evaluate his delusions. Patient was found to have paranoid thoughts and an anxious affect. It was determined by the psychiatry team that the patient's psychosis was likely due to his methamphetamine use history and an antipsychotic medication was started, which the patient refused. Patient was later discharged on room air to the sheriff's department.

3. Discussion

SPM is a rare diagnosis in the general population. The proposed mechanism occurs via a differential pressure gradient that develops between the alveoli and lung interstitium. This pressure gradient can occur either by increasing the alveolar pressure (e.g. Valsalva maneuver) or by decreasing the interstitial pressure, as occurs with increased work of breathing. These changes in pressure lead to alveolar rupture, gas dissection through the bronchovasicular fascia, and dissemination into the lower pressure mediastinal cavity (Macklin effect) [10]. Once air traps in the mediastinum, it decompresses into the soft tissues leading to subcutaneous emphysema.

Etiologic and precipitating factors of SPM in the literature include “no apparent cause”, physical exercise, drug use (especially cocaine, marijuana, and methamphetamine), labor, prolonged shouting, violent coughing, vomiting, asthma exacerbation, and respiratory infections [5]. One systematic review that spanned 22 years showed that one or more of the following symptoms and signs were present in greater than 10% of cases: chest pain,

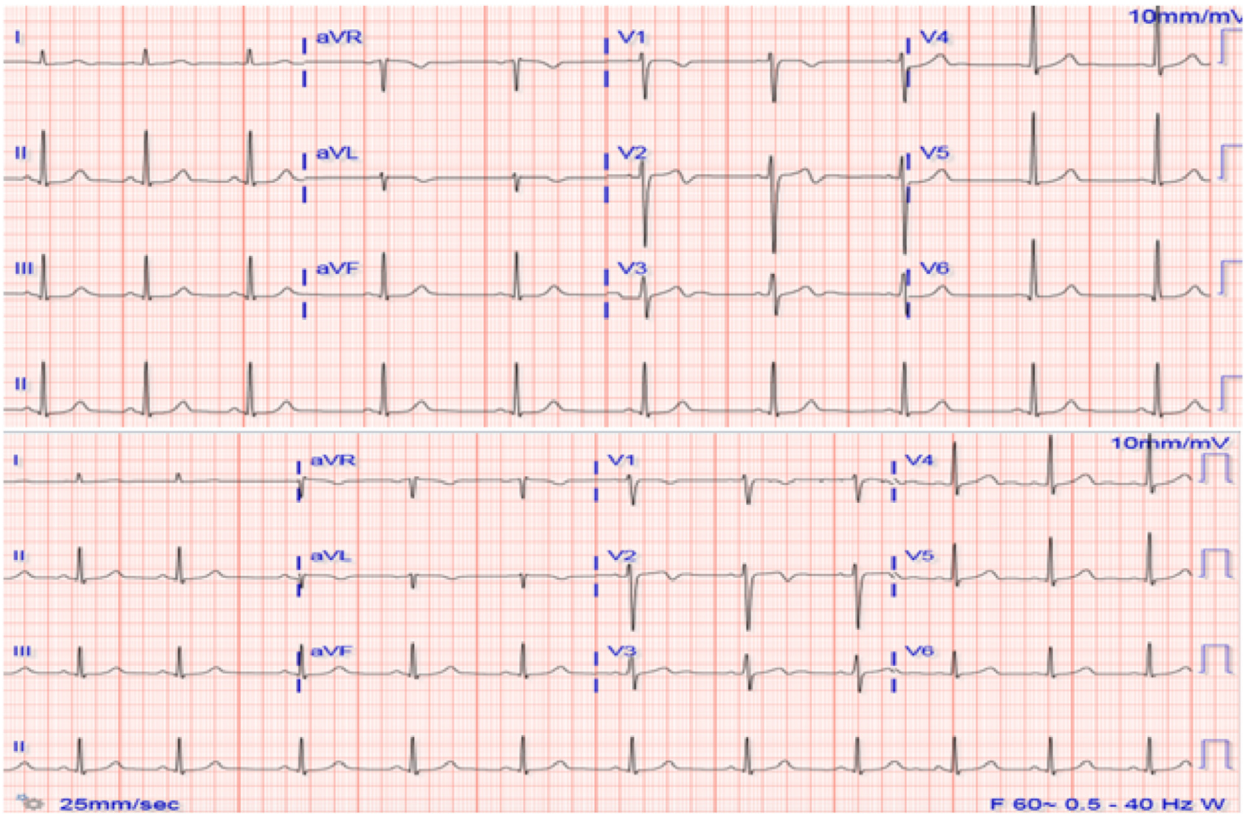

Fig. 3. **(A)** Initial ECG showing sinus bradycardia, signs of LVH, and Wellens' sign in V2–V3. **(B)** Repeat ECG shows a persistence of Wellens' sign.

dyspnea, subcutaneous emphysema, persistent cough, cervical pain, dysphagia, and Hamman's sign [5]. It should be noted that an asymptomatic presentation of SPM was not listed among this extensive review of case reports.

In fact, asymptomatic pneumomediastinum, whether spontaneous or nonspontaneous, appears to be exceedingly rare in the literature. One case of asymptomatic pneumomediastinum occurred following wisdom tooth extraction due to pressurized air passing from the sublingual and submandibular spaces into the retropharyngeal space, which is connected to the mediastinum [7]. Another case report discussed isolated orofacial trauma following the explosion of a pressurized pneumatic pipe, which led to subcutaneous air tracking into the mediastinum [6]. Finally, another case report discussed asymptomatic pneumomediastinum occurring after a thoracic epidural block [9]. Besides similar imaging, the only other significant finding shared in these three cases was subcutaneous emphysema.

Similar to the preceding cases, the patient in this report also presented without typical symptoms, but did have crepitus without significant soft tissue swelling in the supraclavicular and cervical regions. He also had subcutaneous emphysema on CXR and CT chest imaging. Perhaps the most unusual aspect of this case is that this patient had asymptomatic *spontaneous* pneumomediastinum, as opposed to the previous cases in which the etiology is apparent. It is proposed that this patient likely had two contributing factors: intense physical activity and inhalational drug use. Previous cases of SPM after intense physical exercise have been described in the literature [3,8,14]. Though trekking through the woods may not be as intense as other activity-induced cases, the fact that this patient's SPM was incidentally discovered and subsequently resolved at discharge without intervention suggests that the inciting event must have occurred just prior to admission, making the patient's hiking a likely cause. That being said, the patient also had a significant inhalational drug history, including daily marijuana and frequent methamphetamine use (UDS was positive for cannabinoids, negative for amphetamines). Stimulants have been shown to be both a precipitating and predisposing factor in pneumomediastinum, including methamphetamine as seen in this patient [1]. Cocaine, crack cocaine, and ice methamphetamine involve aggressive inhalation, as well as performance of Valsalva maneuvers, prior to exhalation. SPM has similarly been attributed to marijuana in the literature [13].

The diagnostic workup and management of SPM first includes chest x-ray, followed often by chest CT. Diagnostic studies to evaluate more sinister causes of mediastinal air is largely unjustified, unless there is a suggestion of esophageal perforation, cervical infections, recent thoracic surgery, or trauma [5]. One can determine if an esophagogram is warranted to rule out esophageal perforation based on certain risk factors (i.e. age >40 yo, severe vomiting, abdominal tenderness, elevated WBC, or CT scan findings (pleural effusion, significant atelectasis, pneumopericardium, or pneumoperitoneum)). If these risk factors are absent and the patient appears clinically nontoxic, then esophagogram is not needed and a diagnosis of SPM can be made [2,11]. The patient may be observed for deterioration, but otherwise SPM can be treated conservatively with bed rest, analgesics, and oxygen therapy. Assuming no complications arise, the patient can be discharged without follow-up in the outpatient clinic.

4. Conclusion

SPM is rare and primarily affects young adults. Chest pain, dyspnea, and subcutaneous emphysema are the most common signs and symptoms with an asymptomatic presentation, as in this

case report, being especially uncommon. The etiology of SPM is often not apparent, but exertional exercise, drug use, and activities which produce Valsalva maneuver can be precipitating factors. The diagnosis consists of CXR and/or CT chest, while also ruling out more serious causes of mediastinal air based on presentation and risk factors. Management of SPM is largely supportive and consists of bed rest, oxygen therapy, and analgesics. Discharge occurs within a few days and recurrence is low, making outpatient follow-up unnecessary in this benign condition.

Conflicts of interest

None.

Funding

None.

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