Primary spontaneous pneumothorax due to high bleb burden

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Abstract

Primary spontaneous pneumothorax (PSP) occurs most frequently in young, tall, lean, male smokers without any known underlying lung disease. It is an important diagnosis to make promptly in order to prevent progression to obstructive shock. We present a case report of a young, male, former-smoker and polysubstance abuser with no prior lung history that developed acute dyspnea at rest and was found to have a large right pneumothorax on chest x-ray. A pig-tail catheter was utilized, but his course was complicated by a recurrent tension pneumothorax. Chest computed tomography (CT) revealed a significant bleb burden and the patient underwent a lung wedge resection with mechanical pleurodesis. What made our case unique were the chest x-rays revealing blebs that could have predicted the patient’s recurrent pneumothorax as well as the multiple potential risk factors for developing blebs and a pneumothorax. All patients with recurrent PSPs and those with higher risk initial PSPs (e.g. blebs) should undergo preventive therapy with pleurodesis. We hope that clinicians can benefit from utilizing these representative chest x-ray images showing blebs.

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1. Introduction

Primary spontaneous pneumothorax (PSP) occurs in people without known underlying lung disease. The incidence of PSPs depends on the region and ranges anywhere from 7.4 to 37 per 100,000 for males and 1.2 to 15.4 per 100,000 for females [1]. PSPs tend to occur more commonly in men, especially those who are tall, lean, in their early 20s, and smoke [2]. They are also more common in patients with family history of Birt-Hogg-Dube syndrome or Marfan syndrome, and can even be associated with more unusual conditions such as thoracic endometriosis leading to catamenial pneumothorax [3, 4]. PSPs typically present with sudden onset of dyspnea and pleuritic chest pain with diminished breath sounds and hyperresonant percussion on the affected side. Tension pneumothorax manifests with vital sign instability including labored breathing, tachycardia, hypotension, hypoxemia, and contralateral tracheal deviation [2]. Spontaneous pneumothorax requires prompt recognition to prevent progression to obstructive shock.

2. Case report

A 25 year old male former-smoker with prior history of polysubstance abuse and previously treated provoked PE presented to the emergency department with a two day history of sudden onset dyspnea at rest. His prior drug use history included occasionally both smoking and injecting methamphetamine as well as 7 years of almost daily intravenous (IV) heroin. Previously, he had presented in cardiac arrest secondary to a heroin overdose. He also had a 7 year history of smoking marijuana and cigarettes daily. The patient was very adamant about not having used any illicit drugs or inhalational products for the past 1 year. He denied any recent trauma and prior testing for HIV was negative. Further questioning revealed that a maternal uncle had a primary spontaneous pneumothorax in their early 20’s.

The patient’s presenting symptoms and prior history prompted chest x-ray imaging which revealed a large right pneumothorax with partial collapse of right lung and mild mediastinal shift (Fig. 1). A pig-tail catheter was placed causing near full expansion of lung. The chest pain and respiratory symptoms improved with narcotic pain medication. The chest tube remained to wall suction for 12 hours with no evidence of air leak and therefore was placed to water seal. After being to water seal for 12 hours the chest tube was clamped with no evidence of further pneumothorax on chest x-ray. The patient did well until going for a walk when he developed acute

** Abbreviations: PSP, Primary spontaneous pneumothorax; CT, Computed tomography; VATS, Video-assisted thoracoscopic surgery.
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shortness of breath and relative hypoxia with oxygen saturation in the low 90s. Repeat chest x-ray showed a marked right tension pneumothorax with near complete collapse of right lung (Fig. 2). The chest tube was put back to wall suction with improved expansion on follow-up chest x-ray (Fig. 3). Chest computed tomography (CT) showed a persistent right-sided pneumothorax, despite good position of apical pigtail catheter, and apical blebs (Fig. 4).

Thoracic surgery was consulted for persistent chest tube air leak, difficulty maintaining full lung reexpansion, and high bleb burden. He underwent a right video-assisted thoracoscopic surgery (VATS) therapeutic lung wedge resection of the right upper lobe with mechanical pleurodesis (Fig. 5). Surgical pathology showed pleural fibrosis, reactive mesothelium overlying subpleural blebs, underlying lung parenchyma showing respiratory bronchiolitis, and no evidence of malignancy. Postoperative chest x-rays showed bleb removal with complete reexpansion of right lung. He incurred no postoperative complications and was doing well at follow-up.
3. Discussion

Addressing a pneumothorax promptly is important because they can potentially progress to a tension pneumothorax and obstructive shock. There should be a low threshold to evaluate for a spontaneous pneumothorax in any patient with dyspnea, since these can occur without an obvious precipitating event. Recognizing a pneumothorax on chest x-ray is not necessarily difficult, but if the diagnosis is not considered and missed, devastating consequences could ensue.

Once found, initial management of a pneumothorax depends on the extent and can include simple observation, 100% oxygen, needle aspiration, chest tube, or thoracoscopy [5]. If stable and ≤ 2–3 cm distance between the lung and chest wall on x-ray, oxygen with observation is appropriate [5]. If unstable or if > 3 cm distance between the lung and chest wall on x-ray, needle aspiration and/or chest tube insertion is indicated [5].

After initial pneumothorax management has been accomplished, the risk for PSP recurrence needs to be assessed to guide long-term treatment strategies. PSP recurrence rates range from 23 to 50% over a 1–5 year period, but the highest risk is in the first 30 days [6]. Smoking cessation is extremely important in preventing recurrence [7]. It is recommended that all patients with PSP recurrence, initial PSP requiring VATS or tube thoracostomy management (e.g. blebs), and patients who have an occupation/hobby where pneumothorax recurrence would be dangerous (e.g. pilot or scuba diver) should undergo preventive therapy with VATS pleurodesis or chemical pleurodesis via pleural catheter [5,8,9].

This case demonstrates how young patients can initially compensate very well despite severe pneumothorax on imaging. Part of what makes this case interesting were the multiple potential risk factors for developing blebs and a pneumothorax including occasionally both smoking and injecting methamphetamine, a prior 7 year history of daily IV heroin use, smoking marijuana and cigarettes daily, as well as family history of a spontaneous pneumothorax in a maternal uncle in their early 20’s [3,5,7,10–13]. He was adamant about not having used any illicit drugs or inhalational products of any kind for the past 1 year, but it is possible that he was not completely forthright. His prior IV drug use placed him at risk for developing IV drug abuse-associated apical bullous emphysema, talcasis leading to blebs, and the potential to contract the human immunodeficiency virus (HIV) and pneumocystis jiroveci that can lead to blebs and pneumothorax [10–13].

What made our case unique were the chest x-rays revealing blebs that could have predicted the patient’s recurrent pneumothorax [14]. Because blebs indicate a high risk of recurrence, detecting them on chest x-ray can potentially aid in risk stratification and guide treatment [14]. This highlights the value of thorough chest x-ray inspection. We hope that our representative chest x-ray images with detectable blebs will serve as illustrative examples for clinicians.

Conflict of interest

Justin M. Segraves and Megan M. Dulohery have no conflicts of interest to report.

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