EM CASE OF THE WEEK.
BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH
Care Warriors

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Primary Spontaneous Pneumothorax

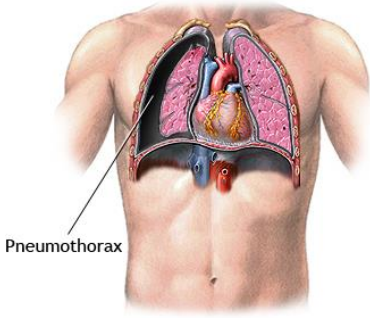
A 45 year old male with a past medical history of hypertension and tobacco abuse presents to the ED with mild shortness of breath for the past few days. He denies chest pain and states it is difficult for him to catch his breath. He states he has never had symptoms like this before, and denies any inciting events responsible. The patient has a 20+ pack year smoking history. Physical exam reveals absent breath sounds on the right side, with normal lungs sounds on the left. Cardiac examination revealed tachycardia with normal heart sounds. The remainder of the physical exam is unremarkable. Vital signs show tachycardia and an oxygen saturation of 90% on room air. Chest radiographs revealed a right sided pneumothorax measuring 5-6 cm. Which of the following is the most appropriate management for this patient?

A. Oxygen supplementation and observation for 3-6 hours.

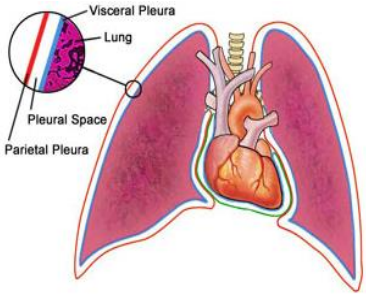
B. Hospital admission and pulmonology consultation.

C. Chest tube insertion and admission.

D. Aspiration and observation.



A pneumothorax is a collection of air within the pleural space (between the visceral pleura of the lung and the parietal pleura of the chest wall).



EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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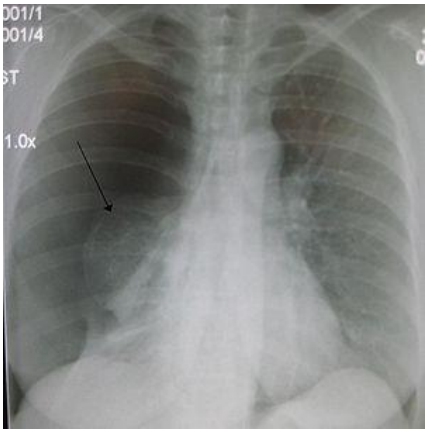
The correct answer is C. Due to the size of this patient's pneumothorax, chest tube insertion is indicated and he should be admitted.

Primary spontaneous pneumothorax (PSP) is a pneumothorax that occurs without an inciting event in a person who does not have known lung disease. A pneumothorax is a collection of air within the pleural space (between the visceral pleura of the lung and the parietal pleura of the chest wall). It can lead to partial or complete pulmonary collapse. PSP differs from secondary spontaneous pneumothorax (SSP) in that SSP occurs due to a complication of underlying lung disease. A worsening variant of pneumothorax, called a tension pneumothorax, occurs when the air introduced to the pleural space continues to increase due to air trapping and causes cardiorespiratory compromise. Tension pneumothorax can develop in 1-2% of cases of PSP. While PSP is said to occur without known lung disease, those who suffer from PSP likely have unrecognized lung disease. In this instance, the cause of the pneumothorax is typically a ruptured subpleural bleb[1].

Incidence/Risk Factors:
The incidence of PSP in men is 7.4 per 100,000 and 1.2 per 100,000 in women. The reason for this considerable difference is unknown. Age of incidence in men is typically 20-30 years old, and 50-55 years old in women.

Risk factors include: smoking, male gender, family history, and body habitus[1].

Pathophysiology:
PSP is caused by ruptures of blebs and bullae. These ruptures cause air to move into the pleural space with increasing positive pressure. Increasing amounts of intrapleural pressure ultimately leads to alveolar collapse. As mentioned earlier, tension pneumothorax is a more severe form and is due to air continuing to enter the pleural space on inspiration, but not being able to exit. This increasing amount of air trapping can lead to cardiorespiratory compromise and is life threatening[1,2].



A chest radiograph of a right sided, large pneumothorax.

Clinical features:
PSP typically occurs when the patient is at rest. Clinically the appearance varies widely, ranging from asymptomatic to severe cardiopulmonary compromise. These signs and symptoms usually correlate with the amount of air within the pleural space itself. Pleuritic chest pain described as sudden, severe, and stabbing in nature can be seen. Dyspnea is the most common sign, however, reduced/absent breath sounds unilaterally, hyperresonance, and subcutaneous emphysema are also indicators of pneumothorax on physical exam[1].

Diagnosis:
PSP can be seen on chest radiograph; the diagnosis is established when a white visceral pleural line is seen. This visceral pleural line exhibits the interface of lung and pleural air. In addition, reduced or absent lung markings are a feature of PSP. Ipsilateral lung compression and collapse can also be seen, but contralateral deviations commonly seen in tension pneumothorax do not rule out PSP. Deep sulcus sign is also a sign of pneumothorax on chest radiograph. It is described as dark and deep costophrenic angles on the affected side.
CT scanning is not performed unless abnormalities are seen on chest radiograph or if underlying lung disease is suspected[1].

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Treatment:
Initial management for PSP is aimed at removing the air within the pleural space. Treatment options vary depending on the patient's clinical status and the degree of severity of pneumothorax. If the patient is clinically stable and the pneumothorax is small—less than or equal to 2-3 CM on chest radiograph— then supplemental oxygen and observation is recommended. Oxygen is absorbed 62 times faster than nitrogen. Thus, 100% oxygen supplementation helps displace nitrogen from the pleural cavity, which allows for faster absorption of the air into veins. This increased absorption rate can be 3-4 times faster than room air, especially in large pneumothorax. After 3-6 hours of observation, patients can be discharged with a repeat chest radiograph that shows no progression of the pneumothorax[1,2].
However, if the patient is symptomatic (chest pain or dyspnea) or clinically stable and the pneumothorax is large—greater than 3 CM on chest radiograph—then supplemental oxygen and pleural aspiration is indicated. If aspiration fails, then chest tube placement is indicated. Clinically unstable patients should undergo chest tube insertion as a first line therapy[1].

Recurrence:
It is estimated that recurrence occurs 25-50% of the time, typically within the first 30 days. In patients with recurrent PSP intervention is recommended to prevent further recurrence once the existing pneumothorax has resolved. Options include chest tube insertion followed by video-assisted thorascopic surgery[1].

Take Home Points

- Primary spontaneous pneumothorax (PSP) is a pneumothorax that occurs without an inciting event in a person who does not have known lung disease.
- Tension pneumothorax can develop in 1-2% of cases of PSP.
- Risk factors include: smoking, male gender, family history, and body habitus.
- PSP occurs due to increased intrapleural pressure, leading to alveolar collapse. PSP is caused by ruptures of blebs and bullae.
- Clinically the appearance varies widely, ranging from asymptomatic to severe cardiopulmonary compromise. These signs and symptoms typically correlate with the amount of air within the pleural space itself.
- PSP can be seen on chest radiograph; the diagnosis is established when a white visceral pleural line is seen. Deep sulcus sign may also be evident.
- Treatment options depend on patient presentation and size of pneumothorax.
- Recurrence in the first thirty days is common, and preventative measures should be taken if it re-occurs.

ABOUT THE AUTHOR

This month's case was written by Zachary Kornblum. Zachary is a 4th year medical student from NSU-COM. He did his emergency medicine rotation at BHMC in January 2019. Zachary plans on pursuing a career in Internal Medicine after graduation.

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