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SPONTANEOUS PNEUMOTHORAX - DEADLY AIR IN THE CHEST

Emergency Medicine

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ABSTRACT

25year old male presented with left sided chest pain radiating to neck since last 2 days which aggravated on deep inspiration. He was treated as suspected Acute coronary syndrome and referred to us for further management. He was clinically diagnosed as pneumothorax going into tension with subsequent ICD insertion and Intensive care admission. He was discharged after 7 days of admission with no obvious cause for the ailment.

KEYWORDS

Pneumothorax, ICD

INTRODUCTION

A 25year old Vietnamese guy, sailor in merchant navy by profession presented to the ER with primary complains of left sided chest pain radiating to neck since 2 days. The pain was described as dull aching and aggravated on deep inspiration. He had no history of perspiration, palpitation, syncope , trauma or fall. He was treated as suspicious acute coronary syndrome and was started on prophylactic antiplatelet therapy by the physician on board the ship.

CLINICAL EXAMINATION

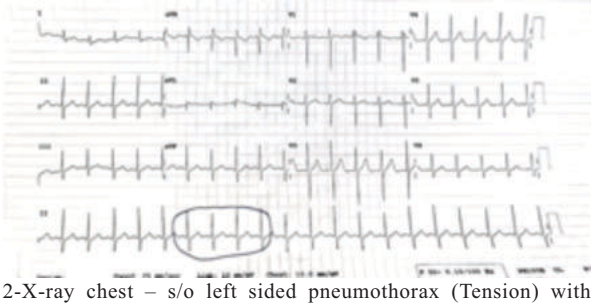
On examination, Patient was tachypnoeic, tachycardic with pulse - 124/min, Bp-100/70mmhg, RR-30/min, RBS-118mg/dl.

ON SYSTEMIC EXAMINATION

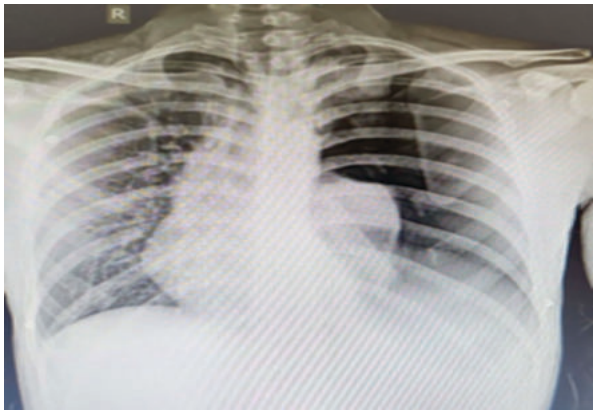
1-RS-Asymmetry of chest wall noted with obvious left sided chest swelling.
-Hyper resonant percussion note over left side
-Air entry markedly reduced on left side
2-CVS-S1 S2 heard, No added sounds
3-P/A-Soft, non tender,BS +
4-CNS-Conscious,Oriented,GCS-15/15

INVESTIGATION IN ER

1-ECG- s/o sinus tachycardia with Electrical alternans.



2-X-ray chest – s/o left sided pneumothorax (Tension) with mediastinal shift to the right with cardiac and tracheal deviation to right.

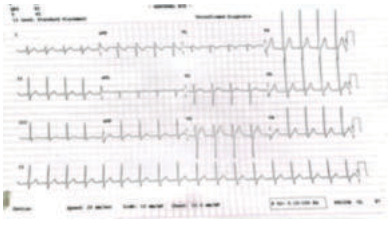


COURSE OF ACTION IN ER

After proper counseling to the patient's attendant and obtaining pertinent consent, Needle decompression was done to relieve the tension and subsequent intercostal chest drainage tube was inserted in the left 5th intercostal space under local anesthesia.600ml of frank blood was drained post ICD insertion.

Post ICD insertion patients vitals improved significantly with heart rate coming down to 108/min and RR to 18/min.

Repeat ECG was done which got reverted to normal sinus rhythm.



After the patient was stabilized in the ER, HRCT chest was done and patient was shifted to the Intensive care unit.

Over the next few days after resolution of hemopneumothorax ICD was removed and patient started with chest physiotherapy and incentive spirometry.

He was discharged on day 7 of admission with no obvious cause found.

He was diagnosed to have spontaneous pneumothorax

(Progression of resolution of hemopneumothorax and lung expansion post ICD insertion)

DISCUSSION

Spontaneous pneumothorax refers to the abnormal collection of gas in the pleural space between the lungs and the chest wall. Spontaneous pneumothorax occurs without an obvious etiology such as trauma or iatrogenic causes. Spontaneous pneumothorax can be classified as either primary or secondary. Primary spontaneous pneumothorax (PSP) occurs when the patient does not have a history of the underlying pulmonary disease, whereas secondary spontaneous pneumothorax (SSP) is associated with a history of an underlying pulmonary disease. Patients may present with a variety of symptoms including tachycardia and dyspnea. A feared complication is tension pneumothorax. The diagnosis of spontaneous pneumothorax is based on clinical suspicion and can be confirmed with imaging. Management of spontaneous pneumothorax depends on multiple factors including the patient's stability, the size of the pneumothorax, occurrence (i.e., first episode or recurrent), and the type of spontaneous pneumothorax (i.e, primary spontaneous pneumothorax or secondary spontaneous pneumothorax).

ETIOLOGY

While primary spontaneous pneumothorax is not associated with underlying pulmonary disease, secondary spontaneous pneumothorax is associated with, but not limited to, the following:

- Chronic obstructive pulmonary disease
- Asthma
- Cystic fibrosis
- Pneumonia (e.g., necrotizing, Pneumocystis jirovecii)
- Pulmonary abscess
- Tuberculosis
- Malignancy
- Interstitial lung disease (e.g., idiopathic pulmonary fibrosis, sarcoidosis, lymphangioleiomyomatosis)
- Connective tissue disease (e.g., Marfan syndrome, Ehlers-Danlos syndrome, rheumatoid arthritis)
- Pulmonary infarct
- Foreign body aspiration
- Catamenial (i.e., associated with menses secondary to thoracic endometriosis)
- Birt-Hogg-Dube syndrome

EPIDEMIOLOGY

Spontaneous pneumothorax occurs more frequently in adults than children and more frequently in males than females. In the United States, the adult incidence of primary spontaneous pneumothorax is estimated to be 7.4-18/100,000 population per year in males and 1.2-6.0/100,000 population per year in females, with similar rates of secondary spontaneous pneumothorax in males and females, 6.3 and 2.0, respectively, per 100,000 population per year. In children, the combined incidence of spontaneous pneumothorax is estimated to be 4.0/100,000 population per year in males and 1.1/100,000 population per year in females. Other risk factors include a history of smoking, and a tall, thin body habitus.

PATHOPHYSIOLOGY

The main principle of the pathophysiology of spontaneous pneumothorax revolves around gas leaking into the pleural space. Spontaneous pneumothorax is a multifactorial process and has been associated with rises in transpulmonary pressure and defects in the visceral pleura. Acute increases in alveolar pressure that exceed the pulmonary interstitial pressure can lead to alveolar rupture and pleural air leakage. Furthermore, points of weakness in the visceral pleura due to subpleural blebs, bullae, lung necrosis, and other connective tissue abnormalities can predispose the alveoli to rupture in both types of spontaneous pneumothorax, though the exact mechanism of how is not entirely understood. Intact bullae without an explicit defect in the visceral pleura have been shown to be associated with spontaneous pneumothorax; however, histopathological analyses and scanning electron microscopic studies of tissue obtained from thoracotomies suggest that sloughing of pleural mesothelial cells may play a significant role in the development of spontaneous pneumothorax.

EVALUATION

The diagnosis of spontaneous pneumothorax is often suggested by the patient's history and physical exam findings, which can be confirmed by imaging. Chest radiography characteristically shows the displacement of the visceral pleural line with a space devoid of lung markings in between. While upright films are preferred, there is evidence that expiration does not necessarily increase the diagnostic yield. Ultrasound has also shown diagnostic potential. There is evidence that ultrasound has greater sensitivity than chest radiography; however, both modalities are limited in how well they estimate the size of a pneumothorax. The use of chest computed tomography (CT) for the diagnosis of spontaneous pneumothorax has been debated. The high sensitivity and specificity of CT can be of value when there is a high index of suspicion for spontaneous pneumothorax, and initial imaging is negative or equivocal. While arterial-blood gas measurements are not necessary for a diagnosis of spontaneous pneumothorax, they can be useful in assessing acute respiratory alkalosis and increases in the alveolar-arterial oxygen gradient when tension physiology is present.

MANAGEMENT

The main goal for the treatment of spontaneous pneumothorax is to evacuate the gas from the pleural space and the prevention of recurrences. The guidelines from the American College of Chest Physicians (ACCP) and the British Thoracic Society (BTS) are focused mainly on the management of pneumothorax in adults but not pediatric cases, specifically. Nevertheless, it is appropriate to initiate 100% oxygen via a non-rebreather mask and continuous cardiopulmonary monitoring for patients with spontaneous pneumothorax. Oxygen increases the rate of absorption of the gas from the pleural space up to four-fold compared to the absorption of 1% to 2% of the volume per day without oxygen. Clinically unstable patients with severe symptoms or symptoms suggestive of tension pneumothorax can be treated with emergent needle decompression as a bridge to tube thoracostomy placement.

For stable patients presenting with a small primary spontaneous pneumothorax for the first time, conservative management with supplemental oxygen and observation of at least 6 hours is recommended. If repeat chest radiograph shows evidence of a stable pneumothorax and the patient has access to adequate follow-up, then the patient can be discharged with strict return precautions for a 24-hour recheck. The British Thoracic Society suggests that certain asymptomatic patients with large primary spontaneous pneumothorax may be considered for observation without active intervention. The American College of Chest Physicians recommends aspiration for large or symptomatic primary spontaneous pneumothorax with a small-bore catheter (14F or smaller) or, if the initial aspiration fails, admission with a chest tube (16F to 22F). Larger primary spontaneous pneumothorax can be further managed with video-assisted thoracoscopy surgery (VATS) or thoracotomy to perform bullectomy, pleurectomy, and mechanical pleurodesis (i.e., dry gauze abrasion). VATS is less invasive than thoracotomy and has been shown to be an effective measure in the treatment and prevention of spontaneous pneumothorax recurrence.

Patients with recurrent primary spontaneous pneumothorax should be admitted with thoracostomy tube placement as a bridge to VATS. In patients that are unwilling to undergo VATS, are poor surgical candidates, or are being managed in an institution where VATS is not readily available, chemical pleurodesis can be performed with the introduction of irritants such as tetracyclines (i.e., doxycycline, minocycline) or talc via the thoracostomy tube. The inflammatory processes associated with chemical pleurodesis lead to the formation of pleural adhesions that effectively obliterate the pleural space.

In adults presenting with secondary spontaneous pneumothorax, both the American College of Chest Physicians and the British Thoracic Society recommend admission with supplemental oxygen and repeat chest radiograph in small secondary spontaneous pneumothorax. The organizations also recommend placement of a pleural catheter or thoracostomy tube if the secondary spontaneous pneumothorax is large, the patient is symptomatic, or the secondary spontaneous pneumothorax is bilateral. Observation alone is not recommended as there is an increased risk for mortality in secondary spontaneous pneumothorax. Referral to a thoracic specialist is recommended, but not until the patient is stabilized with a chest drain.

DIFFERENTIAL DIAGNOSIS

- MI
- Aortic dissection
- Acute pericarditis
- Pulmonary embolism
- Rib & chest trauma

DISPOSITION

The disposition of patients with spontaneous pneumothorax is multifactorial. For patients with a first-time episode of primary spontaneous pneumothorax that is small and asymptomatic, conservative measures can be a reasonable option. For patients with a first-time episode of primary spontaneous pneumothorax that is large and/or symptomatic, aspiration can be attempted as discussed in the treatment/management section; however, failure should prompt admission. It is recommended that all patients with secondary spontaneous pneumothorax regardless of the stability of the patient and the size of the pneumothorax should be admitted. Even with proper management, the recurrence rate for spontaneous pneumothorax is relatively high. Some studies estimate a recurrence rate of over 50% with the highest risk within the first 30 days. However, the rate of recurrence can be less than 5% after VATS with resection of blebs/bullae and pleurodesis.

Special considerations should be made for patients who have travel plans due to risk for pneumothorax expansion. While some guidelines suggest that air travel should be delayed at least a week after radiographic evidence of pneumothorax resolution, there is no definite consensus among U.S. thoracic surgeons about the timeframe. Further investigation of the topic is warranted.

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