EM CASE OF THE WEEK

BROWARD HEALTH

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Traumatic Pneumothorax

A 62-year-old male with an unknown past medical history is evaluated in the emergency department following a motorcycle accident. The patient is complaining of left-sided chest and upper back pain. Temperature is 98.4 F, pulse is 86 bpm and regular, respirations are 28/min, and blood pressure is 136/109 mmHg. Pulse oximetry shows an initial oxygen saturation of 91% on room air. On physical examination, the patient is awake, alert, and in moderate distress. There is minimal use of the accessory muscles of respiration. Bilateral rhonchi are present. Pulses are 2+ in all extremities. There is no evidence of jugular venous distention. No loud murmurs are heard during cardiac auscultation. There are bilateral abrasions to the upper extremities and a 5 cm laceration to the left forehead. The chest wall and lumbar spine are diffusely tender to palpation. A chest x-ray shows the trachea is midline, and there are multiple nondisplaced left-sided rib fractures without evidence of pneumothorax. Trauma CT scans are significant for a small to moderate left pneumothorax measuring 15-20% and fractures of the right L2-L4 transverse processes. Continuous pulse oximetry shows oxygen saturation drops to 86% on room air, and 2 L of oxygen are administered via nasal cannula with improvements in respiratory status. Which of the following is the most appropriate next step in management?

A. Chest tube placement

B. Intubation

C. Needle thoracostomy

D. Observation

E. Thoracentesis

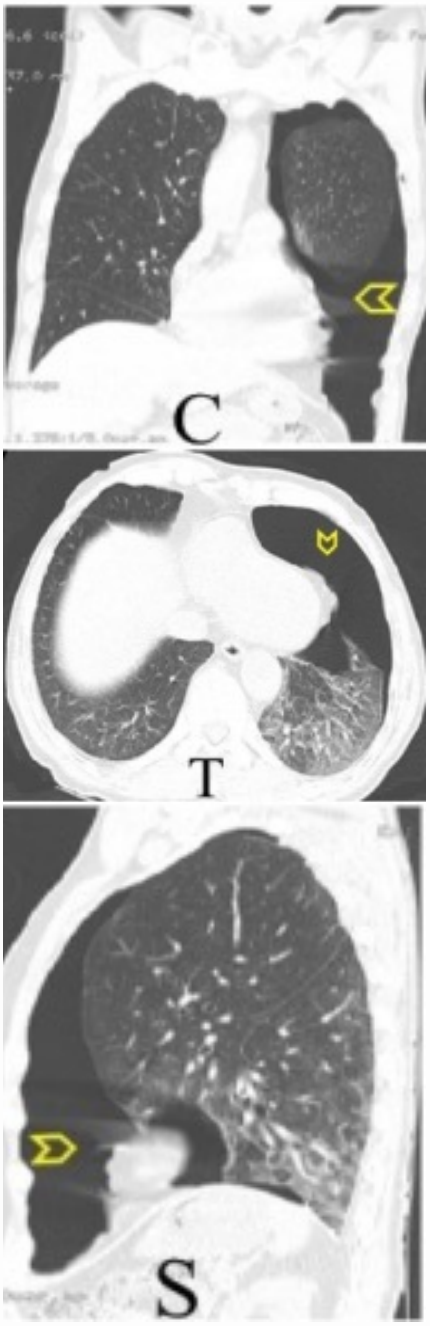

Fig. 1. Left pneumothorax (Source: Open-i)

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The correct answer is **A**. This patient has a small to moderate traumatic pneumothorax and is in respiratory distress. Chest tube placement is the most appropriate next step in management.

B. Intubation should be considered in patients unable to protect their airways or those with acute respiratory failure.

C. Needle thoracostomy should be performed before tube thoracostomy in patients with tension pneumothorax.

D. Observation is appropriate for a stable patient with a small (<15%) pneumothorax. In this case, the patient's oxygen saturation is dropping, and he is in distress.

E. Thoracentesis is a procedure used to remove fluid from the pleural cavity.

Discussion

Pneumothorax (PTX) is the presence of air (or any gas) in the pleural space. Pneumothoraces can be broadly classified as spontaneous or acquired. Spontaneous can occur in patients without underlying lung disease (primary) or those with preexisting pulmonary conditions (secondary). Acquired is further divided into traumatic or iatrogenic. Traumatic PTX can be secondary to a penetrating injury or blunt trauma, as seen in this case. Iatrogenic PTX is traumatic PTX induced after procedures including central line placements and endobronchial ultrasound.[1,2] Tension PTX is a life-threatening condition that occurs when the collection of air from a simple PTX continues to expand and compresses mediastinal structures.[3]

Diagnosis

The diagnosis of PTX is generally made by clinical findings and chest radiography (CXR).[4]

Clinical presentation is highly variable and ranges from asymptomatic to severe dyspnea and shock. However, critical physical examination findings include diminished breath sounds, chest pain, and hyperresonance on the affected side.[2]

Computed tomography (CT) scan is the gold standard for diagnosing PTX. However, chest x-rays and thoracic ultrasonography can also be diagnostic. When appreciated on plain radiograph, a visceral pleural edge is identified, with a peripheral area of radiolucency without lung markings (Fig. 2). However, CXRs have poor sensitivity to detect PTX in trauma cases. When missed on initial imaging, it is referred to as an occult PTX.[4] Some studies have shown that up to 76% of all traumatic PTX are missed by the trauma team when reading standard anteroposterior CXRs, and up to 55% are missed by radiologists.[5, 6]

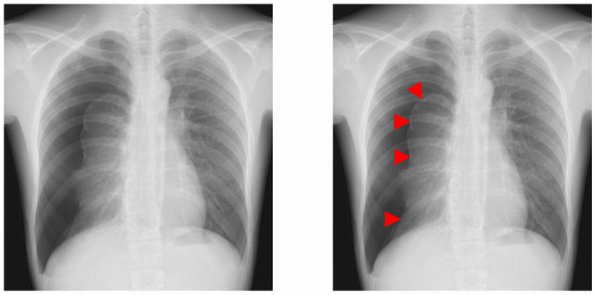

Fig. 2. Right-sided PTX, red arrows indicate the visceral pleural edge (Source: Open-i)

In this case, the initial CXR was negative, and diagnosis was made by chest CT. In trauma, thoracic ultrasonography (US) can also be used to detect PTX. Some studies have found that US has similar sensitivity and specificity in the detection of PTX compared to CT. The diagnosis is best made with the patient supine. The probe should be placed in the sagittal position at the second intercostal space in the midclavicular line on the anterior chest wall. The M-mode is used to determine lung movement. Important findings in patients with PTX include the barcode sign, A-lines, and lung point sign, as shown in the images below.[4]

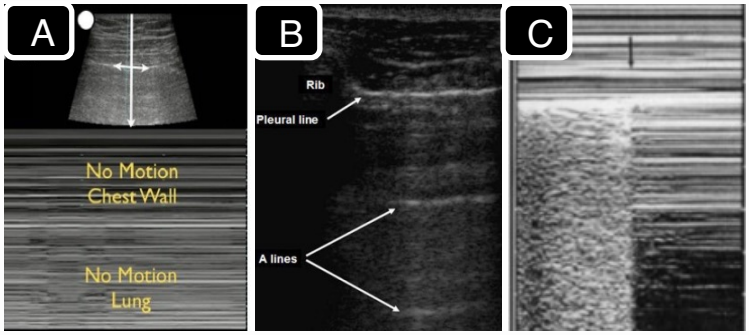

Fig 3. A. Barcode sign. B. A-lines. C. Lung point sign. (Source: Open-i)

Treatment of Traumatic PTX

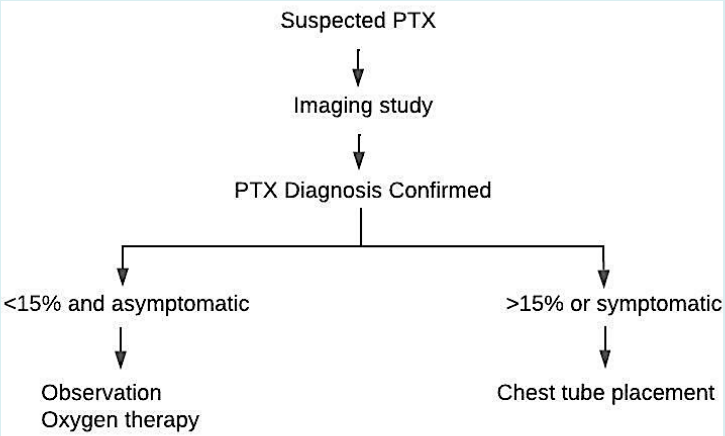

Fig. 4. Adapted from Faruqi et al. (2004) and Noppen and De Keukeleire (2008).

Take Home Points

- Traumatic pneumothoraces can develop from penetrating injury or blunt trauma.
- Expansion of a simple PTX can lead to a tension PTX, a life-threatening condition that compresses the mediastinal structures and may cause obstructive shock.
- CT scans are the gold standard for the diagnosis of PTX.
- Needle thoracostomy should be performed in patients with large pneumothoraces who are hemodynamically unstable (e.g., tension pneumothorax).
- Chest tube placement, also known as tube thoracostomy, is used in patients with moderate to large pneumothoraces and those who are symptomatic and hemodynamically stable.

About the Author

This case was written by Odelvys Granela. Odelvys is a 4th year medical student at NSU-KPCOM. He completed his emergency medicine rotation at BHMC in November 2022. He will be pursuing a career in Internal Medicine after graduation.

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