>>EMERGENCY ULTRASOUND

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PRESENTATION

FIGURE 1. Pneumothorax Exam

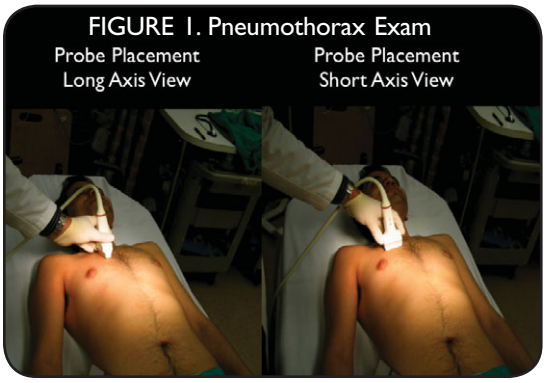
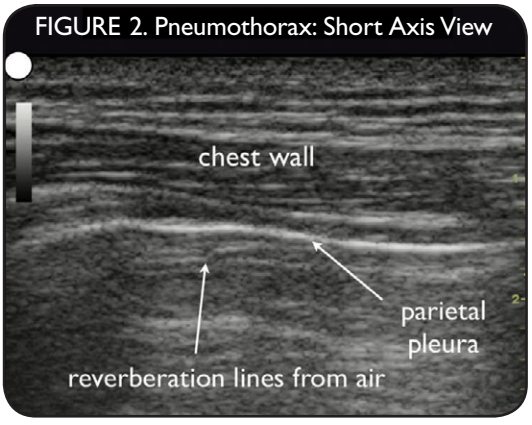


FIGURE 2. Pneumothorax: Short Axis View



>>A 42-year-old male presents to your emergency department. He claims he was stabbed once to his left chest during a robbery. Paramedics responded immediately to the scene and found the patient conscious and breathing. They believed they heard decreased breath sounds in the left hemithorax and called ahead for a trauma team notification to your emergency department. An intravenous line was placed during transport and 500 cc normal saline rapidly infused.

On arrival, the patient is complaining of increased shortness of breath. His vital signs, which were initially recorded in the field, are worsening; they now include a heart rate of 120 bpm; blood pressure, 90/60 mm Hg; and respiratory rate, 30 breaths/min. Auscultation of the left chest reveals decreased breath sounds, but the exam is limited since the patient is taking shallow breaths due to pain. The radiology department is called, but given the clinical deterioration in your patient, you are now very concerned about a tension pneumothorax and are worried about the time it would take to obtain and develop a chest radiograph.

You decide instead to investigate for pneumothorax with ultrasound. You place the high-frequency linear array probe on the patient's chest anteriorly at about the third intercostal space in the midclavicular line (Figure 1). The image you obtain is shown in Figure 2.

What is your diagnosis?

Turn page for conclusion >>

"Emergency Ultrasound" presents clinical cases involving the diagnostic use of bedside ultrasound in the emergency department. Cases can be explored in more detail on the Web in the SoundBytes section of CMEDownload.com, which can be accessed directly at www.sound-bytes.tv. To view a narrated movie of this case complete with ultrasound video, click the link entitled Pneumothorax.

DIAGNOSIS AND DISCUSSION

FIGURE 3. Normal Lung Long Axis View

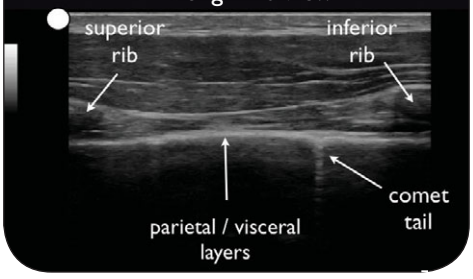


FIGURE 4. CT Scan: Tension Pneumothorax

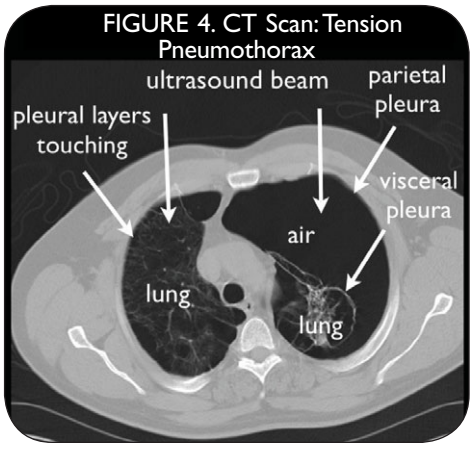
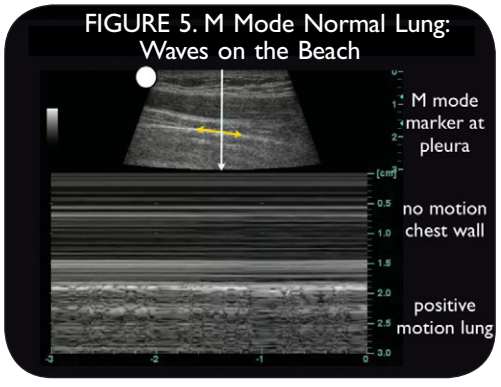


FIGURE 5. M Mode Normal Lung: Waves on the Beach



>>Figure 2 (see previous page) demonstrates a pneumothorax. For the ultrasound exam, the patient should be supine or in a semi-upright position. Position a high-frequency linear array or phased-array transducer in the midclavicular line at the third intercostal space to identify the pleural line. This appears as an echogenic horizontal line approximately one-half centimeter deep to the ribs. The pleural line consists of both the visceral and parietal pleura closely apposed to one another. In the normal lung, the visceral and parietal pleura can be seen to slide against each other, with a glistening or shimmering appearance, as the patient breathes (Figure 3). The presence of this lung sliding rules out pneumothorax. When pneumothorax is present, air gathers between the parietal and visceral pleura, preventing the ultrasound beam from detecting lung sliding. Instead, the visualized pleural line comprises only the parietal layer, seen as a stationary line (Figures 2, 4).

Although the presence of lung sliding is sufficient to rule out pneumothorax, its absence, especially as defined in one intercostal space, is not diagnostic. The absence of lung sliding may also be seen in conditions such as a COPD bleb, consolidated pneumonia, atelectasis, or main stem intubation. M-mode Doppler ultrasound can be helpful in documenting lung sliding, as it will show the classic seashore sign (Figure 5): no motion of chest wall (waves) or motion of the lung (beach). The clinician can increase the utility of the test by examining several more intercostal spaces, moving the transducer inferiorly and laterally. This maneuver may also help identify the lung point, or area where an incomplete pneumothorax interfaces with the chest wall, as visualized by the presence of lung sliding on one side and the lack of lung sliding on the other.

Another sonographic finding seen in normal lung but absent in pneumothorax is the comet tail artifact, a form of reverberation echo that arises from irregularity of the lung surface. This appears as a vertical echoic line originating from the pleural line and extending down into the lung tissue. The presence of comet tail artifact rules out pneumothorax. The combined absence of lung sliding and comet tail artifact strongly suggests pneumothorax. In this patient, tension pneumothorax was strongly suggested by the presence of pneumothorax and hypotension. Immediate needle decompression was performed with a rush of air followed by improvement in vital signs. A tube thoracostomy was placed and the patient was admitted to the trauma surgery service.

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