

## Emergency ultrasound identification of a lung mass

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### Abstract

**Introduction** A 49-year-old woman with HIV and remote tobacco use presented with fever and 2 months of progressive dyspnea. A chest radiograph showed a right upper lobe pneumonia and treatment for community-acquired pneumonia was initiated.

**Materials and methods** The emergency physician performed a bedside lung ultrasound that suggested a more complicated process and prompted computed tomography of the chest. This revealed a right upper lobe mass and lymphadenopathy consistent with neoplasm which was subsequently confirmed on bronchoscopy.

**Conclusions** The role of lung ultrasound in the Emergency Department is reviewed and a new potential application of identifying patients in whom further diagnostic testing may be indicated is described.

**Keywords** Chest ultrasonography · Chest imaging · Lung cancer · Emergency ultrasound

### Case report

A 49-year-old woman with a history of hypertension, HIV on HAART (last CD4 count 449 cells/ $\mu$ L and viral load 50 copies/mL), and remote tobacco use (15-pack-years) presented to the emergency department (ED) with 2 months

of progressive shortness of breath. During this time, she reported having a cough productive of yellow sputum with associated pleuritic chest pain, fever, night sweats, and weight loss of more than 10 pounds. She was treated with azithromycin as an outpatient 6 weeks prior to presentation without improvement in her symptoms. One month prior, she was diagnosed with bronchitis and treated with moxifloxacin, again with no improvement. A few days prior to ED presentation she noticed her sputum was blood tinged. Her vital signs were temperature 101.4 degrees Fahrenheit, heart rate 110/min, respiratory rate 22/min, blood pressure 120/76 mmHg, and oxygen saturation 97% on 2 L/min nasal canula. She had rhonchi in the right mid and upper lung fields and her left lung was clear to auscultation. Her heart was regular, tachycardic, and without murmurs. The rest of her physical exam was otherwise unremarkable and non-contributory.

PA and lateral chest radiographs (Fig. 1) showed diffuse reticular opacities in the right upper lobe that were interpreted by radiology as a developing right upper lobe consolidation. The patient was placed in respiratory isolation and was started on ceftriaxone and azithromycin for suspected community-acquired pneumonia. To further evaluate the right upper lobe, a bedside lung ultrasound was performed by the emergency physician using a 5-2 MHz curvilinear transducer (General Electric Logiq P5, Wauwatosa, WI, USA). Placing the probe posteriorly in the right upper lung field perpendicular to the ribs, the provider noted a hypoechoic mass that did not demonstrate normal lung artifacts; namely, there were no horizontal A lines and absent lung sliding. (Video Clip S1, available as supporting information in the online version of this paper). Adjacent and deep to this hypoechoic mass were regions of lung that had a tissue pattern consistent with alveolar consolidation. Further interrogation of the right lung field demonstrated

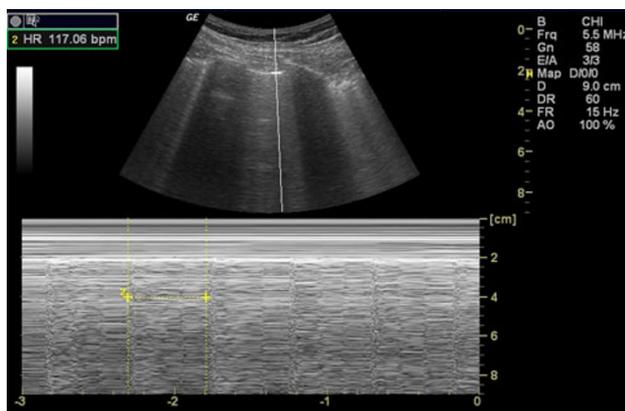
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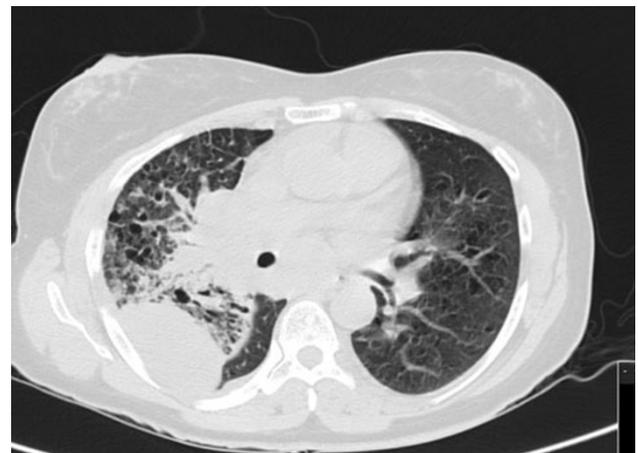
**Fig. 1** PA and lateral chest X-ray showing diffuse reticular opacities in the right upper lobe



**Fig. 2** M-mode imaging of lung demonstrating a lung pulse

diffuse B-lines (hyperechoic, vertical, lung comets that originate at the pleural line). There was no pleural sliding with respiration, but there appeared to be a rhythmic motion at the pleural line that corresponded with the patient's heart rate. (Video Clip S2, available as supporting information in the online version of this paper). M-Mode imaging verified that the pleural movement corresponded with the patient's heart rate and not her respiration and was, therefore, a lung pulse (Fig. 2) signifying complete atelectasis of that portion of lung [1].

Because the lung ultrasound findings suggested a more complicated process than community-acquired pneumonia, a non-contrast chest CT was performed; this demonstrated a right upper lobe mass with heterogeneous attenuation associated with bulky mediastinal and supraclavicular lymphadenopathy compatible with neoplasm (Fig. 3). The CT also showed ground glass opacities with septal thickening suggestive of superimposed infection versus lymphangitic carcinomatosis. The patient was admitted to the hospital, had three negative sputum cultures for acid-fast bacilli (AFB), and received a bronchoscopy and lung



**Fig. 3** Non-contrast chest CT demonstrating a right upper lobe mass

biopsy 2 days into her hospitalization. The pathology showed bronchial mucosa with undifferentiated large cell carcinoma with extensive lymphatic permeation.

## Conclusions

Previous studies have established the diagnostic utility of lung ultrasound in the Emergency Department. Lung ultrasonography has been increasingly used in trauma to evaluate patients for pneumothorax [2] and hemothorax [3]. Indeed, many clinicians have integrated lung ultrasound into the initial trauma management using the Extended Focused Assessment with Sonography for Trauma (EFAST) [4]. Lung ultrasound has also shown promise in the evaluation of acute respiratory failure [5], pneumonia [6], and the assessment of pulmonary artery pressure [7].

In this case, the PA and lateral chest radiographs did not suggest a mass, but the abnormalities seen on lung

ultrasound prompted further evaluation with a chest CT. This case demonstrates an important role for lung ultrasound in the Emergency Department. By identifying patients in whom further diagnostic testing may be indicated, it has the potential to reduce delays in diagnosis and improve diagnostic accuracy when used in conjunction with conventional chest radiography.

**Conflicts of interest** None.

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