CHEST

A Man in His 70s Presenting With Chest Pain and Hematuria

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VIDEO

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A man in his 70s presented to the ED with left-sided chest pain and shortness of breath. The chest pain was pleuritic, localized to the left upper anterior chest, and occurred at rest. He also reported hematuria that started the morning of admission. His medical history was significant for hypertension, and his only medication was hydrochlorothiazide.

Physical examination revealed a thin man who appeared uncomfortable and tachypneic. He was afebrile, with a heart rate of 110 beats per minute, BP of 160/90 mm Hg, respiratory rate of 24 breaths per minute, and oxygen saturation on room air of 92%. Lung examination revealed decreased breath sounds over the entire left hemithorax, with dullness to percussion. Right lung auscultation was normal. Heart sounds revealed normal S1 and S2 sounds, but tachycardic. There was no evidence of jugular venous distention. Abdominal examination was unremarkable, and there was no pitting edema of the lower extremities. Chest radiograph revealed a left-sided opacity and a blunted left costophrenic angle (Fig 1).

After a brief history and physical examination, a bedside ultrasound was performed (CaseVideos 1-6).

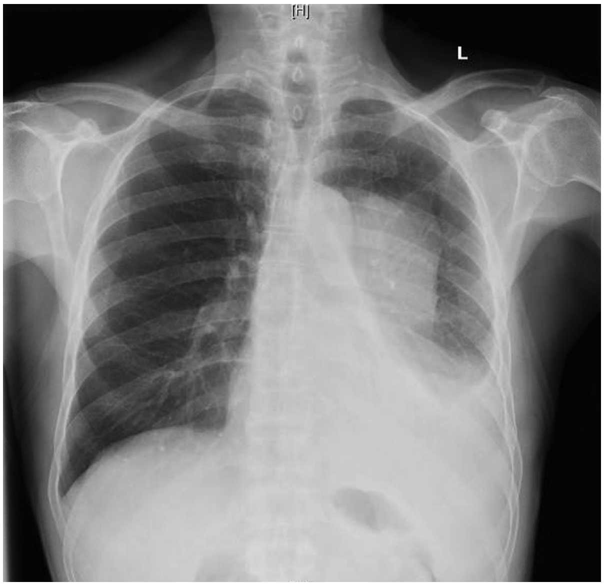

Figure 1 – *Chest radiograph.*

Question: Based on the clinical picture and the ultrasound videos, what is the most likely diagnosis?

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Answer: Left anterior lung mass with probable malignant left pleural effusion. Because of the patient's hematuria, a screening abdominal ultrasound was performed revealing a right-sided renal mass with probable liver metastasis.

Discussion

The patient presented with pleuritic, left sided, anterior chest pain along with hematuria. Given his history, thoracic ultrasonography was performed revealing a hypoechoic area with indistinct borders (Discussion Video 1).

The differential diagnosis of anterior hypoechoic structures at the pleural surface include pleural effusion, alveolar consolidation, abscess, or a mass. Based on the clinical picture, along with the ultrasound findings, this was more consistent with a mass. Masses adjacent to the pleural surface are easily detected with lung ultrasonography.[1] Masses may be of varying echogenicity and surrounded by aerated lung.[2]

Most pleural effusions would be present in dependent areas within the pleural space and therefore be located posteriorly. Loculated pleural effusions may present anteriorly; however, these effusions would push the visceral pleura such that a smooth border would exist between the effusion and the parenchyma, unlikely the irregular border seen in Discussion Video 1. Large pleural effusions may also be seen anteriorly, but they would not have a distinct border separating them from the remainder of the effusion. Alveolar consolidation has appearance of tissue density and may have sonographic air bronchograms, which appear as hyperechoic foci representing small amounts of air in the bronchi, which are not seen on the ultrasound. Lung abscesses appear hypoechoic with irregular outer margins with a hyperechoic ring because of the abscess cavity.[3] Hyperechoic foci may be present within the abscess cavity, representing air within the space. At times it may be difficult to distinguish an abscess vs a mass on ultrasound; however, point-of-care ultrasound is always performed within the clinical context of the patient. This patient had no systemic signs consistent with an infection, thereby making an abscess unlikely.

Thoracic ultrasonography also revealed a left-sided pleural effusion (Discussion Videos 2, 3). A pleural effusion can be identified by visualizing an anechoic or hypoechoic space subtended by the inner border of the chest wall, the diaphragm, and the visceral pleural surface.[4] Dynamic findings are typically associated with pleural effusions, including movement of atelectatic lung, diaphragm, or mobile echoic material that could be seen within the effusion. Metastatic foci may be visualized along the hemidiaphragm or the lung parenchyma in malignant pleural effusions.[1]

Given his hematuria, a screening abdominal ultrasound was also performed (Discussion Videos 4, 5). Renal ultrasound revealed a right-sided isoechoic lesion, not well demarcated from the kidney, that was consistent with a mass. Solid renal masses are heterogeneous, isoechoic, or hypoechoic, which can vary in size and are present adjacent to normal renal parenchyma. Ultrasonography can be used to differentiate between cystic and solid masses. All solid renal masses in adults should be considered malignant until proven otherwise.[5] In addition to the renal mass, diaphragmatic metastasis was seen. The presence of a mirror artifact reflected across the diaphragm is shown. Areas of very high acoustic impedance, such as the diaphragm, may serve as an acoustic mirror and deflect ultrasound beams to the side. Mirror artifacts will always be deeper to the true reflector because the redirected beam takes longer to reach the transducer.[6]

As part of a whole-body approach, a DVT study was then performed to rule out venous thromboembolic disease given his shortness of breath, the pleuritic nature of his chest pain, tachycardia, tachypnea, and hypoxemia. The study did not reveal the presence of DVT. His presenting symptoms were caused by chest wall mass and accompanying pleural effusion.

Figure 2 – *Representative slice of chest CT scan.*

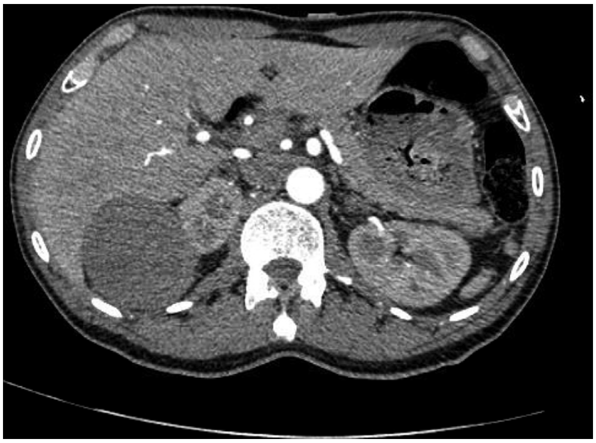

Figure 3 – *Representative slice of abdominal CT scan.*

Ultrasound-guided needle biopsy can easily be performed for peripheral lung lesions, anterior mediastinal masses, and pleural lesions.[7,8] The lesion must abut an accessible area of the parietal pleura, which is determined by imaging the lesion with confirmation of a clear needle path without intervening air, bone, organs, or vasculature.[9] Discussion Video 7 shows color Doppler over the intended pathway of needle insertion without evidence of large vessels. Pneumothorax is an uncommon complication of a transthoracic needle biopsy of a pleural-based lesion. This is because there is no intervening normal lung parenchyma in the path of the needle.

An ultrasound-guided biopsy of the mass was performed, which revealed renal cell carcinoma. Subsequently, a left-sided tunneled intrapleural catheter was placed to alleviate his respiratory symptoms caused by the malignant pleural effusion. Eventual CT imaging confirmed our ultrasound findings (Figs 2, 3).

Reverberations

1. *Clinical history and physical examination can be used to effectively guide the point-of-care ultrasound examination.*
2. *Ultrasound may differentiate the various causes of anterior chest wall lesions and guide diagnostic and therapeutic procedures.*
3. *Abnormal findings on renal ultrasound are common, and distinguishing cystic and solid lesions has important clinical implications.*

Acknowledgments

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Additional information: To analyze this case with the videos, see the online article.

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