Visual Journal of Emergency Medicine 16 (2019) 100591

Contents lists available at ScienceDirect

Visual Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/visj

Visual Case Discussion

Undifferentiated dyspnea: Ultrasound assistance

Greg S. Zahn

Department of Emergency Medicine, Indiana University School of Medicine, Indianapolis, IN, USA

ARTICLE INFO

Keywords:
Dyspnea
Pulmonary edema
Pulmonary embolism

21yo F presented to the ED with sudden onset dyspnea. She reported recent hospitalization for failed renal transplant removal. She was scheduled the next day for her MWF dialysis. Initial vitals: 90% non-breather, HR 133, BP 168/115. Physical exam was remarkable for tachypnea and accessory muscle use, yet lungs were clear on auscultation. While fluid overload was suspected, pulmonary embolism was considered given recent surgery, sudden onset and clear lungs. US was utilized to assist in diagnosis and was remarkable for evidence of B lines indicative of pulmonary edema with moderate bilateral pulmonary effusions (Figs. 1 and 2). Cardiac US displayed no signs of right heart strain (Fig. 3). Given US findings, the patient was treated for fluid overload and taken emergently for dialysis.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.visj.2019.100591.

Fig. 1. Lung ultrasound, displays diffuse B lines. This ultrasound artifact is representative of fluid in the interstitial space, most often representative of pulmonary edema in clinical practice.

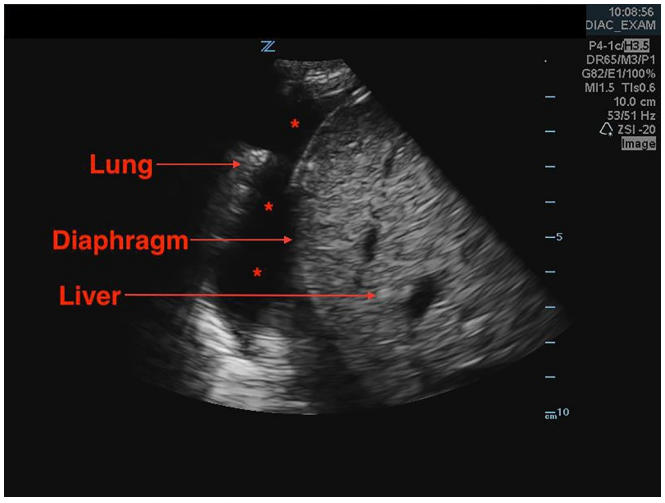

Fig. 2. Lung ultrasound, displays moderate to large pleural effusion. Compressed lung is visualized floating in the pleural fluid. The diaphragm and liver can be seen on the right side of the video.

E-mail address: gzahn@iu.edu.

https://doi.org/10.1016/j.visj.2019.100591
Received 28 January 2019; Received in revised form 25 February 2019; Accepted 1 April 2019

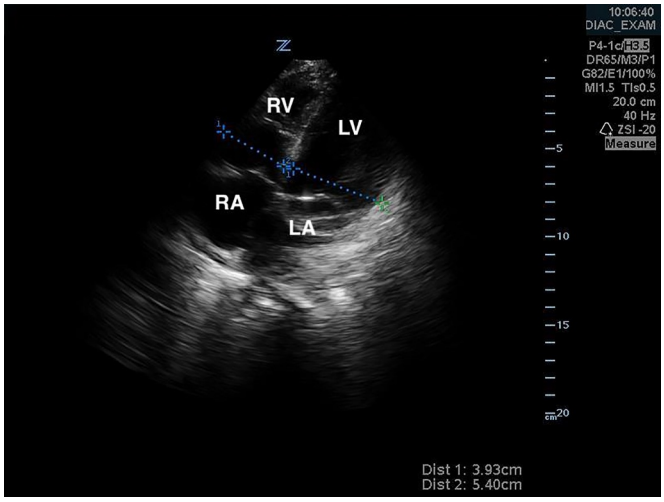

Fig. 3. Cardiac ultrasound, displays an apical 4-chamber view. Image displays the measuring of right ventricular size verses left ventricular size. In this picture, the relationship is normal with the left ventricle being larger.

References

1. Lichtenstein DA, Meziere GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the blue protocol. *Chest.* 2008;134:117–125.
2. Martindale JL. Diagnosing acute heart failure in the emergency department: a systematic review and meta-analysis. *Acad Emerg Med.* 2016;23(3):223–242.

Questions

1. What is the definition of B lines on lung ultrasound?
   a. Hyperechoic comet tail artifact arising from the pleural line, spreading the depth of the screen.
   b. Linear artifact arising from pleural line parallel to ultrasound probe.
   c. Hypoechoic artifact arising deep within the image.
   d. Hyperechoic area deep to fluid filled structures.
   e. Hyperechoic comet tail artifact arising from pleural line, yet does not spread the depth of the screen.

2. B+ lines are commonly used as the criteria to diagnose interstitial fluid. What is definition of B+ lines?
   a. 1 or more B lines in a single view
   b. 2 or more B lines in a single view
   c. 3 or more B lines in a single view
   d. 4 or more B lines in a single view
   e. 5 or more B lines in a single view

3. How does lung ultrasound compare to CXR and clinical exam in the diagnosis of acute decompensated heart failure?
   a. Ultrasound with higher positive likelihood ration than physical exam, but not CXR.
   b. Ultrasound with higher positive likelihood ration than CXR, but not physical exam.
   c. Ultrasound with a less positive likelihood ration than both.
   d. Ultrasound with higher positive likelihood ratio than both.
   e. All three tests have similar positive likelihood ratios.

Answers

1. Hyperechoic comet tail artifact arising from the pleural line, spreading the depth of the screen. Explanation: A B-line is a name given to an artifact with seven features: a hydroaeric comet-tail artifact; arising from the pleural line; hyperechoic; well defined; spreading up indefinitely; erasing A lines; and moving with lung sliding when lung sliding is present. It reflects the coexistence of elements with a major acoustic impedance gradient, such as fluid and air. Fluid at the subpleural interlobular septum surrounded by air-filled alveoli fulfills this condition. Any condition that causes interstitial edema can cause B lines, yet it is most commonly seen in congestive heart failure patients with fluid overload and pulmonary edema.[1]

2. 3 or more B lines in a single view. Explanation: B+ lines are defined as 3 or more B lines in a single view. This is the most common criterion used for utilizing lung ultrasound to diagnose interstitial/pulmonary edema.[1]

3. Ultrasound with higher positive likelihood ratio than both. Explanation: Ultrasound has a positive likelihood ratio of 7.4, which is quite high when compared to rales on physical exam that carry a likelihood ratio of 1.8. CXR with pulmonary edema carries a positive likelihood ratio of 4.8. Ultrasound can be extremely helpful in the undifferentiated patient with a history of both CHF and COPD. In this patient subset, clinicians can more accurately initiated correct therapy.[2]