
Station 6: Rule out pneumothorax by lung ultrasound

Objectives

- 1) Use of appropriate USG probe
- 2) Identifying Blue points
- 3) Recognize lung sliding on lung ultrasound.



Lung ultrasound in the critically ill

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Purpose of review

Lung ultrasound, which allows a bedside visualization of the lungs, is increasingly used in critical care. This review aims at highlighting a simple approach to this new discipline.

Recent findings

The 10 basic signs are the bat sign (indicating pleural line), lung sliding (yielding the seashore sign), the A line (horizontal artifact), the quad and sinusoid sign indicating pleural effusion regardless of its echogenicity, the tissue-like and shred sign indicating lung consolidation, the B line and lung rockets (artifacts indicating interstitial syndrome), abolished lung sliding with the stratosphere sign, suggesting pneumothorax, and the lung point, indicating pneumothorax. All these disorders were assessed using computed tomography (CT) as a gold standard with sensitivity and specificity ranging from 90 to 100%, allowing us to consider ultrasound as a reasonable bedside gold standard in the critically ill. We use a simple gray-scale unit (without Doppler) with a microconvex probe.

Summary

Lung ultrasound can be used for diagnosing acute respiratory failure (BLUE protocol), managing acute circulatory failure (Fluid Administration Limited by Lung Sonography protocol), and decreasing the use of radiograph or CT (the Lung Ultrasound in the Critically Ill Favoring Limitation of Radiation project). This can be extended from sophisticated ICUs to more austere settings, from neonates to bariatric adults without adaptation, trauma and several other disciplines (anesthesiology, emergency medicine, pulmonology, etc.).

Video abstract

<http://links.lww.com/COCC/A8>.

Keywords

acute circulatory failure, acute respiratory failure, lung ultrasound

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1) Normal lung on USG showing A lines and a still image of lung sliding

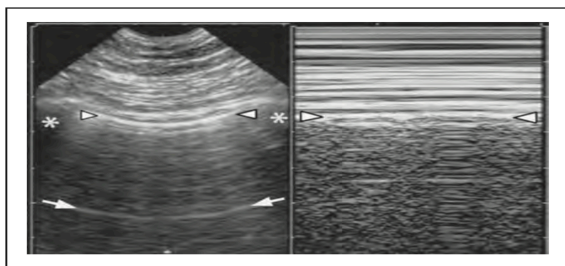


FIGURE 2. Normal lung surface. This pattern at the anterior lung surface of a dyspneic patient indicates the A profile of the BLUE protocol. At the left, the ribs (stars) allow to locate the pleural line (arrowheads): the bat sign. The pleural line is repeated (arrows). At the right, lung sliding is objectified using M-mode, displaying the seashore sign. The A profile is the pattern seen in normal individuals. Adapted with permission [6].

2) Pneumothorax on M mode and 2D USG, lung point

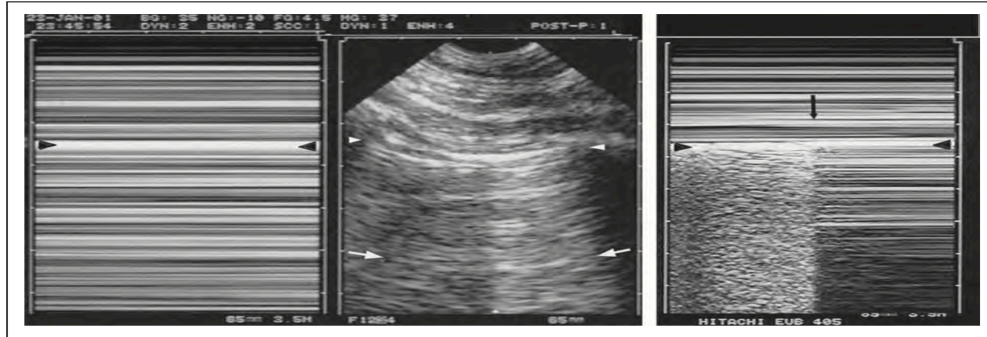


FIGURE 5. Pneumothorax. The three sequential patterns of pneumothorax. Left and first step: the abolition of lung sliding, creating this regular pattern, the stratosphere sign. Middle and second step, only A lines are visible at this area (arrows). Note that here, an incomplete A line is displayed on purpose: A lines can be even more discrete. Anterior abolished lung sliding with the A-line sign, that is, the A' profile, suggest pneumothorax. Right, M-mode objectifying the pathognomonic lung point at the area of junction between dead air (pneumothorax) and living air (inflating lung). Adapted with permission [6].

3) The Blue protocol- advanced learning

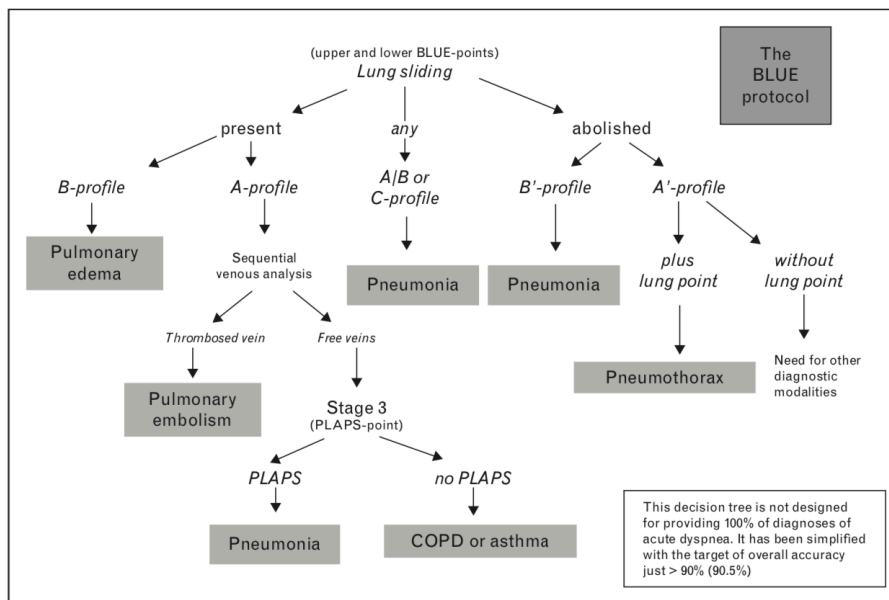


FIGURE 6. The BLUE-protocol decision tree. This decision tree shows how, using lung and (in the case of an A profile) venous data, the main acute disorders generating acute respiratory failure can be approached using ultrasound. Adapted with permission [16].