To the Editor:

In the article by Lichtenstein et al (July 2008),1 the authors describe the use of lung ultrasound in evaluating patients with acute respiratory failure. The algorithmic approach Bedside Lung Ultrasound in Emergency, the BLUE protocol, is described with a diagnostic accuracy of 90.5%. Three hundred and one consecutive patients with acute respiratory failure were assessed; 260 were included (cardiogenic pulmonary edema, 64; pneumonia, 83; decompensated COPD, 49; acute asthma, 54; pulmonary embolism, 21; and pneumothorax, 9) and 41 were excluded from the study (rare causes, 9; no final diagnosis, 16; and several final diagnoses, 16). Among all the patients with a final diagnosis, there was not a single patient with diaphragm paralysis. This could be because of the design of the BLUE protocol, as it does not have assessment of diaphragm function as a step in the algorithm. Diaphragm paralysis, although not a common cause of acute respiratory failure, is likely underdiagnosed, and it is not unusual for an intensivist to come across such a case. Diaphragm paralysis can be diagnosed with the use of bedside ultrasound.1,3 Unilateral diaphragm dysfunction is easier to diagnose than bilateral and, in the presence of comorbid conditions, can be a cause of acute respiratory failure. Trauma (surgical or nonsurgical) and malignancy involving the phrenic nerve are common causes of diaphragm paralysis.4 The assessment of diaphragm function in patients with these conditions and respiratory distress is important. I came across two cases with acute hypercapnic respiratory failure who had unilateral diaphragm paralysis (one left and one right), as seen on ultrasound and fluoroscopy examination. In both cases, unilateral diaphragm paralysis was considered to be the main reason for respiratory failure, but comorbid conditions were believed to be contributory. I have been using the BLUE protocol in my clinical practice and have found it to be helpful in bedside evaluation of patients with acute respiratory distress. I suggest that the addition of diaphragm function assessment, a simple technique, as a step in the BLUE protocol will enhance its diagnostic accuracy.

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References


Bedside Lung Ultrasound in Emergency (BLUE) Protocol

A Suggestion to Modify

To the Editor:

We thank Dr Khosla for his interest in the Bedside Lung Ultrasound in Emergency (BLUE) protocol.1 The phrenic analysis is part of our systematic ultrasound examination that uses our polyvalent microconvex probe, but we have not included it in our decision tree.

Isolated phrenic palsy is not listed as a cause of acute respiratory failure.2 As Dr Khosla admitted, it should be associated with a comorbid condition contributing to respiratory failure. In addition, phrenic palsy is a rare event3 not seen in any patient in the BLUE protocol, as defined in our methodology regarding the final diagnosis. Independent of its rare presence as an associated cause of respiratory failure, and even if the comorbid disorder is seen on ultrasound, this association should be a mixed cause, which by definition is excluded from the BLUE protocol like rare causes (even if easy to diagnose).4

Even if a phrenic palsy was diagnosed in acute respiratory failure, this finding would be of minor relevance because the immediate therapy would depend on the associated disorder; there is no specific routine therapy for phrenic palsy. Additionally, patients with genuine phrenic palsy would be intubated and sedated, making the diagnosis impossible because mechanical ventilation would generate passive phrenic movements.

Phrenic palsy may be more difficult to diagnose than thought. Confusion between phrenic palsy and akinesia is common. Akinetic cupula in severe pneumonia is a common feature seen in 27% of cases.1 In these patients, akinetic cupula is redundant with abolished lung sliding (data included in the decision tree of the BLUE protocol). Akinetic cupula in severe pneumonia may be linked to interpleural inflammatory adherences, not phrenic palsy, when this akinesia persists after mechanical ventilation.

Our phrenic analysis differs from traditional approaches.5 We do not require the presence of pleural effusion or atelectasis nor subcostal approaches. Spleen or liver dynamic, or thorax-abdominal junction behavior (where the diaphragm is inserted), or, again, lung sliding (B-lines excursions) indirectly but efficiently document phrenic function.

This correspondence is an opportunity to specify that the BLUE protocol can be extended to assess additional data (ie, consolidation volume, bronchogram dynamics, ventricle behavior, ultrasound-assisted thoracentesis) for refining diagnoses such as pneumonia. It also can be applied to rare, but ultrasound-accessible diagnoses, including massive pleural effusion (taking volume into...