Specific Ultrasound Signs May Improve Bedside Early Diagnosis of Ventilator-Associated Pneumonia

To the Editor:

We read with great interest the article by Zhou et al,¹ who investigated the use of lung ultrasound combined with procalcitonin for the diagnosis of ventilator-associated pneumonia (VAP). This work confirms the applicability of lung ultrasound as both a diagnostic tool and a monitoring tool in patients on mechanical ventilation² and also underlines how VAP remains a major clinical issue, secondary to associations with an increased duration of mechanical ventilation and ICU length of stay. The need for a reliable bedside tool is supported by the confirmed poor diagnostic accuracy of the Clinical Pulmonary Infection Score.

Lung ultrasound signs alone showed high sensitivity but low specificity. This result may be justified by the ample ultrasound criteria considered by the authors as positive for a VAP diagnosis. In fact, the authors took into consideration any type of consolidation: subpleural consolidations (identified by the shred sign) and lobar or hemilobar consolidations (identified by a tissue-like pattern).¹ Subpleural consolidations have been demonstrated to be a sensitive but not specific sign for VAP³ because they are visualized in lung contusions,⁴ ARDS,⁵ and pulmonary embolism.⁶ Within lobar/hemilobar consolidations, the authors describe different kinds of air bronchograms: absent, static, and dynamic, this last further divided into punctiform and linear.¹ All these different patterns are finally considered as positive for VAP diagnosis. However, a static or absent air bronchogram indicates

non-patent airways and obstructive atelectasis.⁷ A punctiform dynamic air bronchogram rules out atelectasis but is not specific for VAP.⁸ On the contrary, a linear-arborescent dynamic air bronchogram has been demonstrated to be highly specific for VAP.³ Therefore, including all these possible findings in lung ultrasound criteria for VAP necessarily leads to a very sensitive tool, with a high negative predictive value but with poor capability to distinguish different pathological patterns and, therefore, with low specificity. Sensitivity and specificity of lung ultrasound signs separately would have been interesting.

Moreover, the authors applied a longitudinal scan technique¹; however, in this view, the visualization of the pleura is limited by the width of the intercostal space⁹; a transversal scan that is aligned with the intercostal space may significantly improve ultrasound signs detection and may reduce false-negative results.⁹ Lung ultrasound signs were combined with procalcitonin to improve diagnostic accuracy.¹ This is in contrast to previous findings, which showed no positive impact of procalcitonin on the performance of both clinical- and ultrasound-based scores for a VAP diagnosis.^{3,10} The role of procalcitonin in a VAP diagnosis, therefore, is controversial.¹¹

Finally, quantitative culture of distal samples is recommended for a VAP diagnosis.¹¹ Comparison with a non-accepted standard technique, that is, semiquantitative analysis of bronchoalveolar lavage or tracheoaspirate, may be confusing. The authors, therefore, associated computed tomography findings with microbiological samples; although this choice surely enhances the diagnostic accuracy, it leads to difficulty in interpreting the results: for instance, 35.6% of subjects classified as non-VAP had strongly or very strongly positive semiquantitative cultures.¹ Moreover, it is unclear how the authors interpreted microbiological findings in subjects with ongoing antibiotic therapy.

In conclusion, the article from Zhou et al¹ confirms the interest of lung ultrasound for the diagnosis of VAP, a challenging issue for the intensivist, with significant clinical repercussions. The choice of more-specific ultrasound signs, such as linear or arborescent dynamic air bronchogram, and the use of transversal scans may further improve the accuracy of an ultrasound-aided VAP diagnosis.

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Driving Pressure or Tidal Pressure: What a Difference a Name Makes

To the Editor:

In a recent article in this Journal, Baldo-mero et al¹ provided, for the first time, data on actual ranges of driving pressure for a variety of patients during mechanical ventilation. This is a well-written and useful article, and our intent is not to criticize it but to point out how the common use of the term driving pressure may lead to confusion.

In the Quick Look section of the article, driving pressure (ΔP) is defined as “the difference between P_{plat} [plateau pressure] and end-expiratory pressures.”¹ This is not a generally true statement (despite

Fig. 1. Volume control breath with inspiratory hold, no inspiratory effort and no auto-PEEP.