hemorrhage, neoplasm, and others. Additional sonographic signs are needed for further differentiation (3). Even the presence of air bronchogram inside the consolidation on lung ultrasound has been reported in patients with pulmonary neoplasm, not pneumonia (4).

In summary, the presence of air bronchogram inside the consolidation is not specific for pneumonia, and further sonographic signs such as dynamic air bronchogram are needed to support the diagnosis. In this case, resorptive atelectasis rather than pneumonia is more likely to be the cause of the rapid relief of pulmonary consolidation on lung ultrasound. ■

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Reply

From the Author:

We thank Dr. Keng for his interest in our article (1) and for the opportunity to give some additional information. We would like to point out that the aim of the article was to briefly illustrate lung ultrasound (LUS) monitoring of aeration (2, 3). However, Dr. Keng raised an interesting question that is beyond the scope of our article: how to affirm the diagnosis of pneumonia when a consolidation is seen by LUS?

First, a resorptive atelectasis is usually seen in a chest X-ray as an opacity characterized by important volume loss and associated with mediastinal shift. All these signs can be seen by LUS. In our case there was no major volume loss and there was no mediastinal shift.

Second, we agree with Dr. Keng that dynamic air bronchogram, and not static air bronchogram, is in favor of pneumonia. But the aspect of this dynamic air bronchogram is more informative than the amount of bronchogram. In a pioneering article, Lichtenstein and colleagues showed that dynamic air bronchogram is indicative of pneumonia, distinguishing it from resorptive atelectasis (4). In their article, Lichtenstein and colleagues also described linear, tubular, and arborescent dynamic air bronchograms, and pointed out that dynamic linear bronchogram should be distinguished from dynamic punctiform bronchogram. We have studied the diagnostic value of LUS for the diagnosis of ventilator-associated pneumonia in a prospective multicenter study (5). We showed that even consolidation with punctiform dynamic air bronchogram is not enough to affirm pneumonia. Only linear air bronchogram has *per se* good diagnostic value for affirming pneumonia. Readers (and Dr. Keng) can see the dynamic linear bronchogram in the supplementary video (1). In this video, readers can also see that the plane of the probe was kept constant in the bronchial axis.

To summarize, all these LUS signs (preserved lung volume, no mediastinal shift, dynamic air bronchogram, and dynamic linear air bronchogram), combined with the large amount of removed purulent secretions during bronchoscopic suction, convinced us that what we have in this patient is a case of pneumonia. ■

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Predicting Survival in Amyotrophic Lateral Sclerosis: Should We Move Forward from Vital Capacity?

To the Editor:

In amyotrophic lateral sclerosis (ALS), the challenge for the treating pulmonologist is to predict disease progression leading to

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respiratory failure, the need for mechanical ventilation, and death. The duration of this period is important for the task of counseling and preparing patients to face major decisions such as the use of ventilatory support (either noninvasive or invasive). Despite the importance of clinical data, such as the severity of bulbar involvement, predicting muscle weakness progression toward respiratory failure remains a difficult task, in which objective standardized measurements are pivotal.

Current international guidelines (1) recommend the performance of spirometry with forced or slow vital capacity; other respiratory tests seem to have an ancillary role, for example, sniff nasal inspiratory pressure is recommended only for a specific group of patients, such as those with weak lips. Despite spirometry being widely available and maintaining a central, first-line role in the diagnosis and follow-up of respiratory disease, a limitation should be acknowledged in the evaluation of patients with neuromuscular disease. In these patients pulmonary function test results may be affected by diaphragmatic dysfunction leading to a decrease in total lung capacity and vital capacity. However, the relationship between lung volume and muscle force is nonlinear, with muscle dysfunction occurring first, whereas the decrease in lung volume becomes evident only late in the progression of the disease. Despite this physiological principle, the more recent literature remains focused on vital capacity to predict the progression of muscle weakness (2).

Polkey and colleagues shed light on this matter; their article may be considered a proof-of-concept study (3). In a large cohort of patients with ALS, the authors performed comprehensive physiological respiratory muscle evaluation and monitoring until death or introduction of mechanical ventilation. The authors focused on the prognostic value of noninvasive and invasive tests of respiratory muscle. Tests directly assessing the muscles, such as sniff and twitch transdiaphragmatic pressure determination, demonstrated excellent performance, showing a linear decline with progression of the disease. Among noninvasive tests, sniff nasal pressure was an excellent predictor of mortality. On the other hand, sequential measures of vital capacity remained stable until the patient was close to death or noninvasive ventilation was required (3).

The authors highlighted the potential role of these findings in designing clinical trials for a rare disease such as ALS. We think that the consequences of this study might go even further because, for the first time, it has been shown that vital capacity, the current recommended test in the clinical evaluation of patients with ALS, should probably not be used as a stand-alone tool for monitoring disease progression. Although spirometry provides useful information about overall respiratory function, the specific muscular involvement in ALS requires respiratory muscle function evaluation. A panel of tests has already proved to be accurate in predicting survival (3); the challenge is to diffuse and prioritize them for clinical evaluation. Among nonvolitional tests, magnetic twitch transdiaphragmatic pressure is considered the reference test to evaluate diaphragmatic function in clinical research (4). Its adoption into clinical practice deserves attention. Other tests, such as diaphragmatic ultrasound, provided interesting preliminary data in patients with ALS (5).

We conclude that Polkey and colleagues provided a strong rationale to extend the respiratory evaluation in ALS beyond the assessment of lung volumes, into the specific domain of respiratory muscle evaluation. To this end, further research is needed to confirm feasibility outside reference centers and to provide cost-effective protocols fitting for patients with ALS. ■

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