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CHEST

Lung Ultrasound B-Lines in Interstitial Lung Disease

Moving From Diagnosis to Prognostic Stratification

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Lung ultrasound (LUS) has been initially proposed as a point-of-care diagnostic tool in critically ill patients, especially in ICUs and EDs.[1,2] In the last few years, we have witnessed a huge escalation of interest in this revolutionary approach, which has further increased during the novel coronavirus pandemic.[3] Meanwhile, its use has expanded in different clinical settings and for the evaluation of chronic conditions, such as in pulmonology, nephrology, and rheumatology.[4]

The sonographic B-lines detected by LUS are signs of pulmonary interstitial syndrome that have been assessed in pulmonary fibrosis since the beginning of the new millennium.[5] LUS has been investigated in connective tissue diseases, and in particular in systemic sclerosis-related interstitial lung disease (SSc-ILD), to test their diagnostic power and to compare the sonographic signs with chest CT.[6] All available data have underlined the diagnostic accuracy of B-lines, which usually show high sensitivity compared with CT, although quite low specificity. Because of these characteristics, the main clinical application of LUS in the setting of SSc and other connective tissue diseases is mainly related to a screening approach. LUS has the potential to indicate those patients who, in high percentages, develop ILD during the time course of the disease.[7]

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In this issue of *CHEST*, Gargani et al[8] have the merit of addressing for the first time the issue of the prognostic value of B-lines in ILD to predict the worsening of pulmonary involvement. The study population is large, considering that SSc is a rare disease, and the time of observation very long. Results simply show that the respiratory function tends to deteriorate more in patients showing a high number of B-lines than in patients with fewer B-lines. This observation may be considered expected, but often those indexes that prove to be useful for the diagnosis do not necessarily show prognostic power. B-lines have a prognostic value that predicts a progression toward pulmonary fibrosis. This is demonstrated by the observation that in a subgroup of the population studied, LUS detected B-lines even before the overt diagnosis of SSc-ILD. Thanks to the prognostic projection of this study and the long observation time, Gargani et al[8] demonstrated that B-lines, even though they remain poorly specific, may allow an early diagnosis when applied in the population at high risk of complicating with ILD. The prognostic value of B-lines in patients without a previous diagnosis of ILD underlines relevant clinical implications of this examination. The results of this study implicate that rheumatologists should consider B-lines as a red flag, even in the absence of an established diagnosis of ILD. The added value of B-lines in combination with anti-topoisomerase I positivity, a known prognostic marker in SSc, also highlight the potential clinical translation of these data in the ambulatory office of the rheumatologist, and the importance of a multiparametric approach to better classify the disease. The significant inverse correlation of the number of B-lines with percent diffusing capacity for carbon monoxide ($R = -0.50$; $P < .0001$) also strengthens the clinical importance of LUS, that it is not merely an imaging tool, but it has sound pathophysiological implications.

As for similar application of LUS in other settings,[9] feasibility was 100%, and the correlation between the two expert readers on B-lines number assessment was very high. Quantification of B-lines, although quite imprecise in nature, can be less important in the acute setting, but it is more relevant in chronic conditions, especially for the follow-up and, as shown by these data, for prognostic stratification.

The authors mention that 40% of patients had pleural line alterations, and their presence was associated with a significantly higher number of B-lines. Pleural line alterations are usually present in pulmonary fibrosis and are one of the features that can be useful in differentiating cardiogenic from noncardiogenic B-lines. However, the authors have not addressed the prognostic value of this sign when compared with B-lines. Irregularities of the pleural line do not correspond to alteration of the anatomic pleura that is not involved in the disease. Rather, the sonographic image of an irregular pleural line is the effect of the subpleural interstitial alterations with decrease of aeration in the lung periphery. Although one may observe a perfectly regular pleural line with multiple B-lines in the early phase of the disease, the irregularity of the pleural line is always and for definition accompanied by B-lines. For this reason, the morphologic description of the sonographic image of the pleural line may be redundant information once the diagnosis has been done. B-lines remain the main critical signs to diagnose and prognosticate ILD.

The prognostic role of B-lines in SSc-ILD shown by the data obtained in the study of Gargani et al[8] highlights the robustness of the ultrasound biomarker as a powerful sign of pulmonary interstitial involvement. It is now up to the rheumatology community to fully understand the potential clinical applications of this examination in this very fragile patient population and apply the potential usefulness of LUS in the daily routine. Of course, rheumatologists and pulmonologists should never forget the many limitations of LUS. B-lines remain a nonspecific sign of interstitial diseases. They represent a sign of increased density of the peripheral lung parenchyma and partial loss of aeration.[10] When LUS is performed, the interpretation of the US pattern is always linked to the necessity to integrate all the available information and consider the clinical context.

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