CORRESPONDENCE

Can lung ultrasound predict histologic pattern of lung injury in critically ill patients with COVID-19? Author's reply

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We thank the comments and suggestions in the letter by Avdeev et al. [1] addressing our recent article published in *Intensive Care Medicine* [2]. Indeed, as pointed out in the original article, we have limitations in our study since we only dealt with the most severe presentation of pulmonary coronavirus disease 2019 (COVID-19), that is, the fatalities. In fact, getting pulmonary tissue from autopsy was an unavoidable limitation and the only possible approach to establish lung ultrasound (LUS)–histological correlations, as lung biopsies are not indicated in COVID-19.

It is expected that part of the fibroproliferative changes in COVID-19-related acute respiratory distress syndrome (ARDS) undergo some regression in survivors. Severe COVID-19 pneumonia is a disease characterised by a simultaneous combination of acute and fibroproliferative changes [2, 3]; in our study, the fibroproliferative pattern was defined as any degree of fibroblastic proliferation within the interstitium and alveolar spaces, including presence of loose aggregates of fibroblasts, collagen deposition, squamous metaplasia, and possible remnants of hyaline membranes [2]. In a larger series of 41 COVID-19 autopsies, we showed that a more advanced fibrotic pattern of pulmonary lesion is present in 39% of the patients and is associated with longer periods of hospitalisation [3]. This finding is in line with the study of Han et al., who showed lung fibrotic-like changes in 35% of severe COVID-19 patients who had a 6-month follow-up chest computed tomography [4]. Therefore, the use of

LUS scores to detect fibroproliferative changes in severe COVID-19 patients can be important to conduct sequential in vivo studies aimed not only to identify the onset, but also to follow the possible partial reversibility of the pulmonary remodelling process. It may be possible that LUS scores can also be used as a complementary tool in the clinical-functional follow-up of patients on antifibrotic therapies for severe COVID-19 pneumonia [5].

Declarations

Conflicts of interest

The authors declare no conflicts of interest.

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