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Intubation and Ventilation amid COVID-19: Comment

To the Editor:

We read with great interest the manuscript by Meng *et al.*[1] reporting their experience about intubation and ventilation in coronavirus disease 2019 (COVID-19) patients. They reported that prone ventilation was frequently used in Wuhan to improve both lung mechanics and gas exchange. The recent published literature regarding the occurrence of acute respiratory syndrome (ARDS) in COVID-19 patients have mainly focused attention on the role of computed tomography in evaluating the radiological manifestations and temporal progression of the disease,[2] while few data have been presented regarding the use of lung ultrasonography,[3] especially in the evaluation of the disease course. One of the major problems during the ventilation of these patients in the intensive care unit is to decide the correct positive end-expiratory pressure level, which requires in most cases a personalized care approach, and to determine the efficacy of prone positioning. In this regard, lung ultrasound can make a major contribution to meeting this challenge. Indeed, previous investigations have already demonstrated that prone position represents an important therapeutic strategy for ARDS patients, improving their oxygenation and short-term mortality.[4] Moreover, the serial evaluation of the effectiveness of positive pressure in these subjects remains fundamental. In this regard, chest computed tomography cannot be routinely used in daily clinical practice to monitor aeration improvement, while lung ultrasonography represents a valid bedside alternative for this purpose.[5] Indeed, ultrasound could be a viable option to reduce the need to transport patients to the radiology department, reducing the exposure of hospital staff and other subjects to COVID-19 patients. Pan *et al.* have recently highlighted that lung recruitability can be effectively assessed bedside in COVID-19 patients with ARDS.[2] Similar results were presented by Wang *et al.*, who reported that bedside lung ultrasonography can be adopted to guide response to prone positioning.[5] It is important to remember that the use of positive pressure cycles remains associated with potential adverse effects such as an increased risk of unintended extubation and/or secondary hemodynamic effects, and the real impact of this strategy in COVID-19 patients with previous cardiac disease remains unknown. For these reasons, the use of lung ultrasound could further implement the use of a personalized approach to the ARDS management and related ventilatory support. In this way, they will able to rapidly assess the patient's pulmonary aeration in every moment without the need to transport an infectious subject to a radiology ward. The authors did not report data regarding the use of lung ultrasonography for the cited purposes. It would be useful to know if lung ultrasonography has been used in their large clinical experience and if so, how it impacted in the patient's management. Since treatment of severe ARDS from COVID-19 is an ongoing challenge, it is important to learn from the patients who have been treated to gain an understanding of the disease's epidemiology, its biologic mechanisms, and the effects of new pharmacologic interventions. Treatment of ARDS from COVID-19 remains an ongoing challenge. It is important to continuously adapt the treatment strategy to the continuous presented evidence based on biologic mechanisms and clinical strategies using a step-up approach ranging from the high-flow nasal oxygen for those patients with moderately severe hypoxemia to endotracheal intubation and/or prone positioning, neuromuscular blockade, inhaled nitric oxide, and extracorporeal membrane oxygenation in case of refractory hypoxemia. Future data will also clarify if lung ultrasound has a role in early diagnosis and prognostication of COVID-19 infection.

Competing Interests

The authors declare no competing interests.

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Intubation and Ventilation amid COVID-19: Reply

In Reply:

We thank Dr. Rigatelli *et al.*[1] for their letter discussing the role of lung ultrasonography in mechanically ventilated coronavirus disease 2019 (COVID-19) patients. They elegantly presented the advantages associated with the use of bedside lung ultrasonography amid the current pandemic. Our paper published in Anesthesiology did not specifically discuss the experience of using lung ultrasonography in critically ill COVID-19 patients.[2] However, we had a letter published in *Intensive Care Medicine* that had specifically summarized our early experience of using lung ultrasonography in COVID-19 patients in Wuhan, China.[3]

The characteristic lung ultrasonographic findings in COVID-19 patients are (1) pleural line thickening, irregularity, and fusion; (2) focal, multifocal, or confluent B lines; (3) multifocal small, nontranslobar, and translobar (with occasional mobile air bronchograms) consolidations; and (4) A lines during the recovery phase.[3] The potential usage of lung ultrasonography in critically ill COVID-19 patients is as follows.

First, although the cause of respiratory failure in COVID-19 patients is primarily related to acute lung injury, other abnormalities involving the airway, chest cavity, chest wall compliance, pulmonary vasculature, and the heart cannot be ignored. Differential diagnosis of the cause of respiratory failure is essential throughout the treatment process, especially when lung injury itself cannot fully explain the whole picture. Lung ultrasonography can help to quickly screen for the potential causes of respiratory failure in COVID-19 patients.

Second, it is the current consensus that the timely application of appropriate gas exchange support is essential in COVID-19 patients complicated with acute hypoxemic respiratory failure. However, what is challenging and sometimes controversial is when to convert noninvasive gas exchange support (such as regular oxygen therapy, high-flow nasal cannula, and noninvasive ventilation) to intubation and invasive mechanical ventilation. Lung ultrasonography assists the decision of which method of gas exchange support to choose in hypoxemic COVID-19 patients. It dynamically monitors the disease progression and evaluates the effectiveness of the ongoing therapy based on the increase and decrease of B lines, B line zones, and consolidation area and volume.

Third, in mechanically ventilated COVID-19 patients, lung ultrasonography can comprehensively assess the potential of lung recruitment based on pulmonary lesions' uniformity and severity and the presence of dynamic air bronchograms and tidal recruitment. The potential is reduced if lung ultrasonography shows multiple sites of large-area consolidation or B line fusion. Lung ultrasonography also facilitates lung recruitment, based on qualitative or semiquantitative lung scores, to understand the condition, duration, and results of recruitment, avoid barotrauma, and adverse hemodynamic effect, and facilitate the titration of positive end-expiratory pressure.[4]

Last, lung ultrasonography facilitates the determination of the duration and frequency of prone position ventilation.[5] It assesses the effectiveness of lung recruitment of the gravity-dependent areas. The aeration of the inferior anterior lungs may representatively predict the effectiveness of ventilation-perfusion matching and the potential of oxygenation improvement. The ultrasonographic semiquantitative scores have also been used to predict the effectiveness of prone position ventilation.

Overall, lung ultrasonography has the potential and unique advantages in the diagnosis, treatment, and prognosis of COVID-19 patients who require gas exchange support. Moving forward, we need well-designed clinical studies to validate the use of lung ultrasonography in facilitating decision-making and improving outcomes in mechanically ventilated COVID-19 patients.

Competing Interests

The authors declare no competing interests.

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Transesophageal Echocardiogram to the Rescue in Diagnosing Ascending Aortic Pseudoaneurysm: Comment

To the Editor:

We read with great interest the article by Yu and Fabbro.[1] However, we found an error in that the labels (Co [suprasternal collection] and Ao [ascending aorta]) in *right image A* and *B* of the original article were all opposite. The reasons are as follows.

The shape of the ascending aorta in mid-esophageal ascending aortic short-axis view should always be round (fig. 1, *blue circle*) rather than oval (fig. 1, *red circle*). In the *right image A* and *B*, the inappropriately low Nyquist limit of 46.2 cm/s overestimated the flow velocity in cavity labeled Co might misguide the authors to regard the laminar flow in ascending aorta as turbulent flow in fluid collection.[2] Besides, the proximal jet width widened steeply after the flow went through rupture site followed by filling the whole cavity labeled Co, which was unconventional. The simultaneous existence of red and blue (laminar flow), brighter color (turbulent flow), even black (no flow) in the color Doppler box, and the accelerated flow began from the opposite cavity wall of the rupture site in the cavity labeled Ao, were also illogical. Crucially, the images *A* and *B* were obtained by xPlane mode, and the flow direction should be from left (ascending aortic proximal site) to right (ascending aortic distal site) in the view (fig. 1B).[3] Hence, the jet direction through narrow rupture site should be from upper left to lower right (fig. 1B), followed by the shunt widening gradually, and the red flow in the cavity labeled Ao might be due to the blood flow diverting direction toward the probe by the hit of the cavity wall.

In short, we suggest that the authors exchange the sites of labels Ao and Co in the *right image A* and *B*. Our viewpoint would be confirmed if the authors offer the video and spectral Doppler of the shunt in rupture site. This article would be more accurate and useful to readers with correct labels attached.