From the Authors:

We read with interest the correspondence from Wengenmayer et al. The authors suggested that we should have adjusted our ventilation strategy under extracorporeal membrane oxygenation (ECMO) to be more protective. As recommended in the Extracorporeal Life Support Organization (ELSO) guidelines (1), we maintained a high positive end-expiratory pressure (PEEP) and reduced VT to maintain a plateau pressure (PP) under 25 cm H²O, but we did not drastically reduce the respiratory rate and the driving pressure (ΔP). The measure of these two parameters are indeed associated with mortality at Day 1 of acute respiratory distress syndrome (ARDS) (2) but not the ΔP in patients with obesity (most of our patients) (3). Thus, reducing ΔP by decreasing VT in patients with obesity could probably not be the main goal when PP remains acceptable. Indeed, the LUNG SAFE (Large Observational Study to Understand the Global Impact of Severe Acute Respiratory Failure) study (2) did not show any superiority of the ΔP to predict mortality. Furthermore, even if the ΔP value at day 1 was associated with mortality, to date, optimizing this parameter during the following days is not correlated with survival. Knowing the specificity of coronavirus disease (COVID-19)–related ARDS (4) and the high rate of patients with obesity treated in our small cohort (58.8%), one could advance that our strategy might be more protective by preventing overdistension.

Our cannulation strategy is much more a matter of debate: the double-lumen cannulas are indeed not recommended in first intension by ELSO (1) because their positioning can be longer and require the use of an ultrasound system. Regarding oxygenation and decarboxylation, this type of cannula is as efficient as conventional cannulation (5). Our team is experienced in this type of cannulation, limiting the adverse events during cannulation. In view of the morphotype of our patients, a single jugular cannulation facilitated their half-seated position and nursing. Moreover, these cannulas have the advantage of encouraging patient mobilization (5) and potentially limiting the consumption of sedatives, which is not insignificant in the context of a period with work overload. Because this type of cannula is associated with more bleeding (6), we wondered if the high rate of bleeding in our series is facilitated by the cannula, anticoagulation, or the transfusion strategy. Our transfusion target is consistent with ELSO guidelines (1). Concerning the anticoagulation, neither of the two patients with serious hemorrhagic events were overanticoagulated, and the five other patients were transfused on minor bleedings or hemolysis without a negative impact on patient prognosis. On the other hand, we reported two oxygenator thrombosis and three thromboembolic events. Considering the high incidence of thrombotic events in patients with COVID-19 and the ELSO guidelines (1), our anticoagulation target seems to be reasonable.

In our series, two patients died of refractory ARDS with pulmonary fibrosis making the respiratory weaning impossible after decannulation. Two patients developed refractory septic shock with a predominance of vasoplegia, making conversion to venoarterial ECMO (VA-ECMO) ineffective. One patient died during cannulation of cardiac tamponade, and one was on VA-ECMO. Thus, optimizing the support during the time either by converting to VA-ECMO or adding a second cannula would not have modified the mortality of our case series. It is important to note that the context of pandemic-induced work overload and the patients’ management by interim intensivists who were not used to taking care of patients with ARDS with ECMO may explain some intensive care management difficulties and suboptimal ventilator settings.

In conclusion, in the context of the pandemic, we have chosen a mastered management of our patients. However, ECMO implantation in refractory ARDS related to COVID-19 allowed more protective ventilation parameters, improving patient status. Our results highlighted a preference for an adaptation of ventilator parameters on the PP and moderate PEEP in this specific series characterized by more obese patients and 65% survival in the ICU. ■
We have read “Respiratory Pathophysiology of Mechanically Ventilated Patients with COVID-19: A Cohort Study” by Ziehr and colleagues with great interest (1). In this letter, the authors described characteristics and outcomes in 66 patients with coronavirus disease (COVID-19) managed with mechanical ventilation. It is a great pleasure to see that 62.1% of these patients were successfully extubated after 2–3 weeks of mechanical ventilation. However, a few questions arose after reading the paper.

First, did all these patients definitely require intubation? Unfortunately, the authors didn’t specify in their letter the indications they had used for intubation, as the higher proportion of successfully weaned patients might be explained by lower severity of COVID-19 pneumonia. As we can see from given data, the respiratory parameters at the ICU admission and during the first 5 days were not so critical.

1. Median PaO2/FIO2 was 182 mm Hg and even reached 245 mm Hg at Day 1 (more than 300 mm Hg in some patients, and one patient had PaO2/FIO2 about 600 mm Hg). Recent randomized controlled trials and meta-analyses that included adult patients with acute hypoxic respiratory failure have shown that patients with even more severe hypoxemia can be successfully managed by high-flow oxygen therapy or noninvasive ventilation (2, 3). For example, in the randomized controlled trial by Frat and colleagues, mean PaO2/FIO2 on inclusion was about 150 mm Hg, and all those patients were treated with standard oxygen, high-flow oxygen, or noninvasive ventilation (2).

2. Median plateau pressure was about 21 cm H2O and median positive end-expiratory pressure (PEEP) was about 10 cm H2O; therefore, the calculated driving pressure was only 11 cm H2O, which is close to driving pressure in healthy lungs. This means that the patients’ lungs had only multifocal alveolar damage and possibly low recruitability (so-called L-phenotype) (4).

Second, why did 95% of patients receive vasopressors? A possible explanation can be seen in Figure 1 by Ziehr and colleagues. A high proportion of patients had PEEP levels exceeding 14 (14–20) cm H2O despite low recruitability demonstrated in COVID–19–associated acute respiratory distress syndrome (ARDS) (4): 15 patients at Day 1 (22.7%), 20 patients at Day 2 (30%), and 21 patients at Day 5 (36.8%). This can lead to lung overdistension and acute cor pulmonale. On the contrary, the reduced PEEP levels in patients with COVID–19 resulted in an increase in lung compliance and a decrease in dead space ventilation in a small observational study (5). Deep sedation can be another possible explanation of the high usage of vasopressors (data not presented).

Third, why did the authors so often use neuromuscular blockade (in 42% of patients)? The benefit of neuromuscular blockers was shown in the ACURASYS trial, in which they were used in patients with PaO2/FIO2 less than 150 mm Hg in the first 48 hours of mechanical ventilation (6). If we look at Figure 1 by Ziehr and colleagues, we can see that only six patients (9%) had PaO2/FIO2 less than 150 mm Hg on Day 2. The neuromuscular blockade can lessen ventilator-induced lung injury by decreasing transpulmonary pressure swings in dependent lung regions in severe ARDS, but it is not the case for mild or moderate ARDS.

Finally, we have a question about the prone position during mechanical ventilation. The authors declared that median PEEP was 13 (interquartile range, 12–15) cm H2O while supine and 14 (interquartile range, 12–15) cm H2O while prone, so the PEEP levels in prone position did not decrease and even increased. This seems useless because a prone position that decreases the lung superimposed pressure must lead to a decrease in the PEEP levels.