Editorial

Is it worth to apply extra-corporeal membrane oxygenation in the immunocompromised patients with severe acute respiratory distress syndrome?

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Venous-venous extra-corporeal membrane oxygenation (VV-ECMO) is a recognized rescue therapy for severe acute respiratory distress syndrome (ARDS) in some reference's centers around the world (1). VV-ECMO is usually applied when the ARDS patients achieve extremes of severe and life-threatening hypoxemia and hypercapnia during invasive mechanical ventilation that impairs the multidisciplinary team to mechanically ventilate these patients without exacerbating the risks of the mechanical ventilation induced lung injury (VILI) (1). For these reasons, when the ARDS patients are extremely hypoxemic [pressure of arterial oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) <50 for more than 3 h or PaO_2/FiO_2 <80 for 6 h] or the ARDS patients are extremely hypercapnic [pH <7.25 with partial pressure of carbon dioxide ($PaCO_2$) of at least 60 mmHg for more than 6 h] after optimization of the protective mechanical ventilation, usually a femoral-jugular venous-venous cannulation with the placement in series with the ARDS lung of an artificial lung (extra-corporeal oxygenation membrane) to oxygenate and remove the CO_2 of drained venous blood that will return to the jugular vein with lower PCO_2 levels and higher PO_2 levels, leading to the improvement of the gas exchange of the ARDS patients. One dual lumen cannula inserted in the right jugular vein can also be used (1-3).

A recent international clinical trial EOLIA (2), that randomized severe ARDS patients to receive immediate VV-ECMO (ECMO arm) or continued conventional treatment (control arm) showed a 60 days mortality of 35% (44/124) in the ECMO arm and 46% (57/125) in the control arm (P=0.07) confirming that VV-ECMO is actually an option to rescue the very severe ARDS patients, while the medical treatment works. Regarding the choice to perform ECMO or not, mainly due to its costs and possible complications of ECMO, as severe bleeding, the Intensivists have to take into account the probable prognosis of this severe patient. In an attempt to better predict the prognosis of severe and refractory ARDS patients that received ECMO for respiratory failure predictive scores were developed as RESP score and PRESERVE score (4) that analyzed clinical and laboratory variables that can help the intensivists to decide whether or not to initiate VV-ECMO in these severe patients. Usually, ventilatory parameters, cause of ARDS, immune status of the patients, gas exchange before ECMO initiation, use of pre-ECMO rescue therapies, age, APACHE, SOFA and SAPS II scores are used to calculate the probability of death before ECMO initiation that can help the intensivists to decide initiation of ECMO rescue therapy and to discuss with the relatives the chances of survival, the possible complications and the future quality of life of the patients submitted to ECMO therapy (1-4).

Although the immune status is part of the survival

prediction scores for VV-ECMO in ARDS (4), it is known that different diseases and degrees and time of immunosuppression, as well as the cause and degree of impairment of the respiratory system function during the acute respiratory failure episode (5), can make a difference in the prognosis of the severe ARDS patient before the use of ECMO. Our group experience (personal observations) also showed that a detailed analysis of the respiratory failure diagnosis, mainly the important distinction between diagnosis of ARDS and an exacerbation of chronic interstitial lung disease is essential to the recovery of the lungs functional of these severe patients. An analysis of previous chest X-rays or computerized thoracic tomography of these patients must be done to assure the previous status of the lungs of these patients before the ARDS onset.

In a recent publication in the *Blue journal*, Schmidt and colleagues (6) reported the article "Six-month Outcome of Immunocompromised Patients with Severe Acute Respiratory Distress Syndrome Rescued by Extracorporeal Membrane Oxygenation, An International Muticenter Retrospective Study" that analyzed a retrospective cohort of 203 severe immunosuppressed ARDS patients submitted to ECMO in 10 international ECMO intensive care units (ICUs) centers that attended the patients from 2008 till 2015. The immunocompromised patients had the diagnosis of solid organ transplant, active solid tumor, hematological malignancies, acquired immunodeficiency syndrome and long-term or high-dose corticosteroid or immunosuppressant. The authors reported successful ECMO weaning of 42%, ICU discharge survival of 34% and a six-month survival of only 30%. They also reported a median ECMO duration of 8 [5–14] days and median ICU length of stay of 25 [16–50] days. Regarding the immune-status of the patients, the authors reported that hematological malignancies had significantly poorer outcomes than the other immunosuppressive situations and that recent immunodeficient status (lower than 30 days compared to higher than 30 days) and ECMO initiation was associated with lower six-month mortality [odds ratio (OR), 0.32; 95% confidence interval (CI), 0.16–0.66, P=0.002]. The multivariate regression analysis still revealed that older age, higher driving pressure, higher $PaCO_2$ levels and lower platelet count were all independent predictors of six-month mortality of these severe patients. The major ECMO complications were ventilator associated pneumonia (50%), major bleeding (36%) and cannula infection (10%). The survival prediction RESP score and PRESERVE score also evaluated in this study showed acceptable performance of these indices [area under receiver operating characteristic (ROC) curve of 0.70 and 0.68 respectively].

This retrospective analysis of 203 immunosuppressed ARDS patients submitted to ECMO (6) added important information to the literature and bed-side experience that will help the bed-side intensivist and the families of these severe patients to decide whether or not to apply VV-ECMO in this life-threatening situation. The diagnosis and time of immunosuppressive status, the acute cause of ARDS (important to exclude exacerbation of chronic interstitial lung disease in this population as well as to make the diagnosis of drug induced lung disease, to avoid continuous drug exposure), levels of $PaCO_2$ and driving pressure, age, levels of platelet, RESP score and PRESERVE score and the clear explanation of possible ECMO complications and the options in the case of ECMO success and failure and the costs of the procedure will help the physicians, the multidisciplinary ICU team and the families to decide if it is worthwhile to submit these severe ARDS patients to VV-ECMO.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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