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Management strategies on venovenous extracorporeal membrane oxygenation

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The use of venovenous extracorporeal membrane oxygenation (VV-ECMO) for severe acute respiratory failure (ARF) has considerably increased worldwide. Therefore, extracorporeal membrane oxygenation (ECMO) teams called for practical guidelines with clear objectives on how to manage ECMO on daily basis.¹ All classical topics of intensive care management have been put in perspective with the use of ECMO, opening multiple areas of research. Good teamwork is the central pillar of any ECMO program. After starting an ECMO run, the medical team has to deal with a triangle including the patient, the ECMO machine, and their interaction. This unique interdependence makes the management challenging, as any change occurring on one side (patient or ECMO) will affect the other side. The priority is to diagnose and treat the cause of ARF. Bronchoscopy showed a reasonable safety for diagnostic yield and clearing airways. The optimization of the oxygen delivery is primordial within the acute period and is represented by matching the ECMO flow and the cardiac output, maintaining an adapted level of hemoglobin, and decreasing causes of high oxygen consumption.² The management of volume status is essential for keeping a precise balance between the patient and the machine. Echocardiography is an essential tool that provides much information before cannulation on hemodynamic, access insufficiency once the patient is on ECMO, initial cannula positioning or readjustment, and finally tolerance to ECMO weaning before and after decannulation.³ Once ECMO provides adequate oxygenation delivery for the patient, the different parameters of mechanical ventilation have to be readjusted with an actual trend to decrease most of them: FiO₂ (25%), inspiratory pressure (10 cm H₂O), and respiratory rate (10 cycles/min) that results in ultra-protective lung

ventilation with an expected tidal volume in a range of 1 – 3 ml/kg.⁴ More than knowing the "best" positive end expiratory pressure, a low driving pressure less than 1 cm H₂O has to be targeted.⁵ This is to ensure that the lungs can rest and recover over time. The exact duration required to reach these settings to allow an improvement on oxygenation is unpredictable. The weaning process is challenging as the gas exchange function improvement and the lung compliance recovery are sometimes not concomitant. It requires daily monitoring to allow early extubation while on ECMO. The anticoagulation has to be balanced not only to avoid any clots in the circuit when just connected, but also to avoid any bleeding. Analgesia and sedation are important for the initial oxygen consumption after cannulation and have to be minimized from the second day to the third day. The goal is for the patient to receive sufficient oxygenation without pain. Depending on their tolerance, patients will sometimes be awake while on ECMO. Then, an active physiotherapy (PT) program

including mobilization, sitting on the edge of the bed, standing up, and walking should follow the passive PT started from the first day on ECMO. Acute renal failure is common during ECMO and should be prevented and treated with renal replacement therapy. Many other points including nutritional support and nosocomial infection prevention are specifically integrated in the patient management. In summary, the management strategies on VV-ECMO are complex and require to master critical care and ECMO knowledge combined with a strong collaborative multidisciplinary environment. The goal is to wean patients from ECMO as soon as clinical parameters permit it while avoiding ECMO-related complications.

Keywords: ECMO, ventilation, interdependence, weaning, echocardiography

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