Coronavirus epidemic: preparing for extracorporeal organ support in intensive care

Zoonotic viral infections are more frequently crossing species to infect human populations. In 2003, the severe acute respiratory syndrome (SARS) virus was transmitted to humans from exotic animals in wet markets in China, and in 2015, the Middle East respiratory syndrome (MERS) virus was transmitted from camels in Saudi Arabia. In both cases, and with the 2019 coronavirus outbreak in China, the original host of the virus is likely to be bats.

The 2019 coronavirus (2019-nCoV) was identified as such with the use of electron microscope analysis, to determine its shape, and genomic sequencing. The virus causes an aspecific respiratory syndrome and a generalised inflammatory response in humans. Patient zero was likely to have been infected by 2019-nCoV at a seafood market in Wuhan (Hubei province, China)—WHO has provided the case definition. Although the information surrounding the current situation is changing on a daily basis, transparency and consistent information surrounding the current situation is critical.

Venousenous ECMO is a complex and sophisticated support for treatment of the most severe forms of acute hypoxaemic respiratory failure; it is performed in specialised, experienced referral centres that are commonly organised into networks, serving large regions or whole countries. The number of critically ill individuals who are infected with 2019-nCoV and who will require ECMO is unknown. In some regions, more than in others, a shortness of ECMO devices could occur and might impose choices that come with important ethical questions. Without predefined criteria to guide the decision on who will get the treatment and in what order, this will lead unavoidably to a first-come-first-serve approach. Clinical presentation, comorbidities, age, number of days of mechanical ventilation before indication for ECMO, and risk for complications are all factors influencing a potentially favourable outcome. 2019-nCoV might also cause severe myocarditis resulting in acute heart failure.


For more on extracorporeal membrane oxygenation centres see JAMA 2011; 306: 769–70

For more on the role of ECMO in pandemic management see Extracorporeal Technol 2000; 4:2:268-80

For more on treatment limitations in the era of ECMO see Articles Lancet Respir Med 2017; 5: 769-70

For more on acute myocarditis associated with novel MERS coronavirus see Ann Saudi Med 2016, 36: 78-80
which might indicate, in the most severe forms, the need for venous-arterial ECMO support.

Extracorporeal CO₂ removal (ECCO₂R) is a technique that can be performed in more ICUs due to the much lower level of complexity than is required for ECMO, but ECCO₂R is not really helpful for severely hypoxaemic patients who actually need full ECMO treatment. Acute kidney injury in these patients is not common, but it might result from a systemic inflammatory syndrome involving combined myocardial and kidney function. In these cases, continuous renal replacement therapies by haemofiltration and haemodiafiltration can contribute to resolution of organ failure. Liver dysfunction can also rarely occur in patients with severe viral infection and it might require extracorporeal blood purification techniques to support the patient until hepatocyte recovery occurs. Finally, a sepsis-like syndrome might occur frequently due to the virus itself or to a superimposed bacterial infection and in this case, since pharmacological approaches have shown poor results, new extracorporeal organ support therapies including haemoadsorption and haemoperfusion, with new sorbent cartridges designed to remove cytokines and other circulating mediators, should be considered.

However the 2019-nCoV epidemic evolves, ICU personnel must be prepared and trained to apply early and optimal interventions. Extracorporeal organ support therapies might represent an important part of the response and clinicians and other health-care professionals need to be familiar with this sophisticated therapy. A call to action should be made to raise awareness of the different extracorporeal techniques, each with specific criteria and modalities of prescription, delivery, and monitoring.

We declare no competing interests.

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