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Letter to the Editor

Letter to Editor Reply: Therapeutic Strategy for Coronavirus Disease 2019 in Patients on Durable Left Ventricular Assist Device Support

To the Editor:

We thank Dr. Imamura for his thoughtful letter in response to our recently published report, Novel Coronavirus Disease 2019 in a Patient on Durable Left Ventricular Assist Device Support.¹ The author raised several important questions regarding the complexity of management of patients with left ventricular assist devices (LVADs) and with COVID-19 infection. Indeed, we agree that patients on durable mechanical support are at high risk and present novel challenges for clinicians if patients are infected with SARS-CoV-2. There are many ongoing issues that need to be further elucidated regarding optimal management in this patient population.

The ideal monitoring strategy for right ventricular function in the setting of LVAD and COVID-19 has not yet been established. It is certainly plausible that infection with SARS-CoV-2 might further worsen right ventricular function, particularly in the setting of acute respiratory distress syndrome (ARDS) and cytokine storm.² It is reasonable to consider echocardiography and/or invasive hemodynamic assessment with pulmonary artery catheterization for any significant clinical change, such as hypotension or requirement of vasopressor/inotropic support, to rule out right ventricular failure. Alternatively, central venous access can be used to measure central venous pressure and venous oxygenation, as was done for our patient.

Implementation of prone positioning has previously been shown to improve oxygenation in patients with severe ARDS.³ However, literature is limited regarding the hemodynamic consequences, safety and efficacy of this maneuver in patients with LVADs. Furthermore, prone positioning presents additional challenges to staff caring for these patients due to limited access to driveline systems and the potential need for urgent supination in case of LVAD alarms. Current literature in non-LVAD patients recommends using prone positioning in patients with ARDS and severe hypoxemia despite ventilation with a high fraction of inspired oxygen (FiO₂) and positive end-expiratory pressure (PEEP) (PaO₂:FiO₂ ratio of < 150 mmHg, with an FiO₂ of ≥ 0.6 and a PEEP of ≥ 5 cm of water).⁴ Given that our patient was effectively ventilated and oxygenated by conventional mechanical ventilation, and owing to unknown hemodynamic consequences and

potential management challenges, implementation of prone positioning was felt to be too high a risk for our patient. We agree with Dr. Imamura that prone positioning should be considered in certain patients with LVADs and ARDS plus severe hypoxemia despite high PEEP and FiO₂ albeit, given the limited data on the hemodynamic consequences of prone positioning in patients with LVADs, close hemodynamic monitoring is recommended.

As mentioned by Dr. Imamura, venovenous extracorporeal membrane oxygenation (VV ECMO) should be considered as a rescue strategy in cases of refractory hypoxemia secondary to ARDS. However, due to significant risks and complications associated with VV ECMO,⁵ this strategy should be reserved only for the most critically ill patients with refractory hypoxemia despite mechanical ventilation. As detailed in the paper, our patient did not meet this threshold and was effectively ventilated by conventional management.

In conclusion, management of patients with advanced heart failure who are on durable mechanical circulatory support and have COVID-19 infection is challenging, given the presence of complex comorbidities and the unique physiology of this patient population. To overcome this challenging complexity, we highly recommend managing these patients with a multidisciplinary approach, involving experts from multiple subspecialties, including advanced heart failure cardiology, pulmonary critical care, cardiac anesthesia, and infectious disease.

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