

QATAR CRITICAL CARE CONFERENCE ABSTRACT

Performing cardiac investigations after VA ECMO implementation in adults

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<http://dx.doi.org/10.5339/qmj.2019.qccc.10>

Submitted: 23 June 2019

Accepted: 8 July 2019

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Cite this article as: Barrett NA. Performing cardiac investigations after VA ECMO implementation in adults, Qatar Medical Journal, Qatar Critical Care Conference 2019;10 <http://dx.doi.org/10.5339/qmj.2019.qccc.10>

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ABSTRACT

Veno-arterial extracorporeal membrane oxygenation (VA ECMO) is commenced for adult patients with severe acute cardiac failure refractory to conventional therapy or following protracted cardiac arrest refractory to cardiopulmonary resuscitation.¹

Following the commencement of ECMO there are several key questions which need to be addressed.

Initial investigations are those which are designed to understand the cause of the cardiac event, gain an understanding of the consequences of the event, particularly on other organ functions and also to direct initial treatment. At this stage, consideration should be given to basic biochemistry, electrocardiography, echocardiography, coronary angiography and computed tomography.² These investigations can explain the origin of the cardiogenic shock and direct therapy, for example stenting of culprit lesions or management of an autoimmune cardiomyopathy.

Additionally, clinical monitoring tools should be implemented to allow understanding of the consequences of the cardiac insult and the impact of ECMO. One of the key problems of peripheral VA ECMO is the increase in afterload for the native heart which prevents appropriate left ventricular

emptying.³ An early understanding of left ventricular end diastolic pressure as well as left ventricular emptying can assist in planning the need for left ventricular unloading devices. Investigations including direct measurements of left ventricular pressure at the time of the coronary angiogram can give a static measure of the impact of afterload. Continuous monitoring using pulmonary artery catheterisation with measurement of pulmonary capillary wedge pressure as well as intermittent echocardiography can help identify rises in left ventricular end diastolic pressure which may result in serious complications including pulmonary oedema, pulmonary haemorrhage, left ventricular distension and left ventricular thrombosis.

Investigations or clinical monitoring is also essential to facilitate optimal patient management. Early in the course of VA ECMO, there are naturally concerns about the ability of the ventricle to empty, however during cardiac recovery there is also the potential for the heart to eject deoxygenated blood, particularly if the lungs are yet to recover. Monitoring including continuous peripheral saturation monitors, arterial blood gases and cerebral near-infrared spectroscopy can all assist in understanding the relative provision of blood to the brain

from ECMO or the native circulations.⁴ Similarly, continuous investigations of the blood supply distal to the cannulated peripheral artery are essential. There is a substantial risk of femoral arterial thrombosis and this can be managed through the use of intermittent doppler signals for the distal vessels or through the use of near-infrared spectroscopy for the legs.⁴

Finally, there is a requirement for monitoring and investigation of the pump and its function/impact on the patient. This includes identification of complications such as haemolysis, microthrombosis, air embolism and disseminated intravascular coagulopathy.⁵ Circuit gases can also be used to demonstrate functioning of the circuit and to prevent exposure of organs to profound hyperoxia or non-physiological pH.

In conclusion, there are a number of key investigations and clinical monitoring devices which should be undertaken following the commencement of VA ECMO to both understand the cause and to predict/prevent complications.

Keywords: veno-arterial extra-corporeal membrane oxygenation, VA ECMO, cardiogenic shock, investigations

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