

CASE REPORT

Primary Hybrid Extracorporeal Membrane Oxygenation in Septic Shock with Acute Respiratory Distress Syndrome: A Case Report

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ABSTRACT

Septic shock with acute respiratory distress syndrome (ARDS) comes with extremely high mortality. In this case report, we are presenting a case of septic shock with biventricular dysfunction rescued by primary hybrid VAV ECMO and de-escalated the support as the organs started improving.

Keywords: Acute respiratory distress syndrome, Hybrid extracorporeal membrane oxygenation, Septic shock.

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INTRODUCTION

Sepsis is a clinical syndrome characterized by systemic inflammation due to infection. The mortality rate estimated is wide-ranging and is more than or equal to 40%¹ when presented with shock. This study discusses a case of septic shock with ARDS rescued with primary hybrid veno-arterial-venous extracorporeal membrane oxygenation (VAV-ECMO).

CASE HISTORY

A 65-year-old male was admitted with fever and respiratory distress for the last 3 days. After admission, his SpO₂ was 82% with a non-rebreather mask (NRBM) and he was drowsy, so he was taken on invasive ventilation. However, he remained hypoxic with SpO₂ of 80%, FiO₂ of 1%, and positive end expiratory pressure (PEEP) of 14. Chest X-ray revealed bilateral infiltrates with basal consolidation with cardiomegaly. Bedside echocardiography revealed he has an ejection fraction (EF) of 25% with severe biventricular dysfunction. Meanwhile, he became hemodynamically unstable and required vasopressors in the form of noradrenaline, vasopressin, and adrenaline after fluid resuscitation as per the surviving sepsis guidelines.² Laboratory results revealed procalcitonin of 16, Total leucocyte count of 1890, and serum creatinine of 3.4. Endotracheal BioFire and subsequent culture analyses revealed methicillin-sensitive *Staphylococcus aureus* for which we started injection flucloxacillin.

In view of rapidly progressing pneumonia with ARDS and hemodynamic instability due to the severe biventricular dysfunction with severe lactic acidosis, the patient's relatives were counseled to rescue him on ECMO support. After informed consent, we cannulated his femoral artery (16 Fr) and vein (24 Fr) with a distal perfusion cannula of 7 Fr and started on veno-arterial ECMO with a flow of 3.2 L. As his right-hand saturation remained lower than 70% with a pulse pressure of 15, another right internal jugular venous cannula (18 Fr) was inserted and he had been taken on a hybrid VAV configuration of ECMO. Vasopressors were tapered off slowly as the mean arterial pressure, lactate level, and urine output improved over 24 hours keeping a touch of adrenaline @0.05 µg/kg/minute dosage to maintain a pulse pressure of more

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than 10. Blood culture did not show any growth of the organism with slowly normalizing procalcitonin and total leucocyte count for the next 3 days.

Serial echocardiographic measurements showed gradual improvement in EF with aortic VTI and we came off arterial support on day 6 and continued on VV ECMO in the femoro–jugular configuration as ARDS remained a concern. After 14 days, both the compliance and the chest X-ray improved significantly, so we could decannulate him after 24 hours of trial-off. The next day, we did a tracheostomy and slow ventilator weaning commenced. Ultimately, tracheostomy decannulation was done on day 23 and discharged the patient on day 27.

DISCUSSION

Adult septic shock remained a controversial indication for ECMO for decades.³ Furthermore, VA-ECMO has been successfully applied as a rescue strategy in pediatric and neonatal sepsis even with a central cannulation strategy. The comparison survival in both groups shown by Yang *et al.* is 18% in adults and 53% in children.⁴ In adults, its role is limited due to ongoing capillary leak and third-spacing and inadequately achieved flow, especially by peripheral cannulation. The recent meta-analysis by Ling *et al.* showed that if the adult septic shock is associated with low EF (less than 20%), the VA-ECMO is beneficial but with normal EF with hyperdynamic sepsis, its role

is very limited.⁵ Moreover, ECMO should be considered a valuable therapeutic option for patients with refractory cardiovascular dysfunction in the context of septic shock.⁶ The hemodynamics, we experienced herein (low cardiac index, elevated filling pressure, profound myocardial depression, and elevated systemic vascular resistance) is certainly a rare but treatable entity in the spectrum of septic shock with VA-ECMO, which resembles almost cardiogenic shock.

In our case, a rapid progressive ARDS with septic shock with low EF compels us to think about VA-ECMO initially. However, in the patient's poor lung condition, a primary hybrid VAV strategy proved better to improve overall oxygenation of both ECMO and the native cardiac output. We de-escalated the support sequentially according to which organ improved first and continued respiratory ECMO till ARDS improved.

CONCLUSION

In adult patients, we suggest addressing rapidly progressing septic shock with ARDS with low EF with primary VAV hybrid ECMO strategy and slowly de-escalating according to the sequential organ improvement.

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