An evolving paradigm for adult extracorporeal membrane oxygenation: Should the indications include patients with sepsis?

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The use of extracorporeal membrane oxygenation (ECMO) in adult patients with cardiac and pulmonary failure has increased several hundred-fold in the United States during the past 10 years.¹ The Extracorporeal Life Support Organization, an international registry, has documented more than 19,000 adult patients treated with ECMO through 2015.² Several factors have led to the increased use of adult ECMO, including pandemic influenza A viral infection, novel cardiopulmonary support circuits, and data demonstrating improved survival with venovenous ECMO over medical treatment in patients with acute respiratory distress syndrome.^{3,4} A recent Expert Review published in the *Journal* provides an excellent summary of the contemporary application of ECMO in adult patients.⁵

In this issue of the *Journal*, Cheng and colleagues⁶ present a single-institution experience with adult ECMO in patients with severe infections. Their stated aims were to identify patient- and infection-related factors associated with survival in patients with septic shock supported with ECMO. They report an overall in-hospital mortality of 70% for the study population.

Based on their multivariate analysis, the authors identified several mortality risk factors in patients with sepsis. Pre-ECMO factors include advanced age, dialysis, and longer interval from admission to initiation of ECMO, and ECMO factors include venoarterial ECMO and the need for cardiopulmonary resuscitation during ECMO.

Improved survival was seen in patients with pneumonia and myocarditis from gram-positive organisms. Dismal survival was observed in patients with bloodstream infections from gram-negative organisms and fungi. Survivors required a mean of 10 days of ECMO support and prolonged mechanical ventilator support (mean, 28 days).

The use of ECMO to treat patients with sepsis remains controversial. The authors conclude that hospitalized patients who develop secondary nosocomial infection and shock from a difficult-to-treat pathogen (ie, gram-negative

Erol Belli, MD (left), and Kevin Landolfo, MD (right)

Central Message

The use of extracorporeal membrane oxygenation in sepsis is controversial because of historically low survival, but new insight can be provided by this single institution review.

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organisms) are poor candidates for ECMO. Considering that the overall mortality rate in patients with septic shock supported with ECMO is >70% in both the present study and previous reports, ECMO should not be considered in this clinical setting.⁷

However, the authors also conclude that the selected use of ECMO in younger patients (age <75 years) with early initiation of ECMO (<96 hours) for respiratory sepsis with gram-positive organisms led to an 86% survival rate (6 of 7 patients surviving to discharge). The results of this retrospective single-institution review should be interpreted with caution, however. Although high survival in selected patients with pulmonary infection as a consequence or cause of acute respiratory distress syndrome may suggest a group that may benefit from ECMO (in addition to patients with H1N1 influenza), until more data are presented to support these findings, expansion of the clinical indications for ECMO to include patients with sepsis is not warranted.

Cardiothoracic surgeons have significant expertise in mechanical cardiopulmonary support and should maintain an active role in the selection and management of patients treated with ECMO. Familiarity with ECMO therapy is essential for clinical practice, and the routine use of ECMO as a salvage procedure in patients with high expected mortality should be discouraged.

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