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Key Words: extracorporeal membrane oxygenation, adult respiratory distress syndrome, extracorporeal cardiopulmonary resuscitation, cardiogenic shock, systematic review

EDITORIAL COMMENTARY

Conventional extracorporeal membrane oxygenation therapy in the current era

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We congratulate Squiers and colleagues¹ on their comprehensive review of extracorporeal membrane oxygenation (ECMO) therapy in an adult population with a focus on patient outcomes of various clinical indications. The article also provides an organized summary of ECMO therapy with updated fundamental features, including cannulation techniques, ECMO circuits, and a monitoring strategy for proper oxygenation in peripheral venoarterial ECMO settings that enriches the knowledge of not only ECMO therapy professionals, but also readers who are unfamiliar with this technology.

ECMO use has markedly increased since the 2009 H1N1 influenza pandemic.² After abatement of the pandemic, ECMO use continued to grow due to results from the

Conventional Ventilator Support versus Extracorporeal Membrane Oxygenation for Severe Adult Respiratory

Takeyoshi Ota, MD, PhD

Central Message

Extracorporeal membrane oxygenation therapy plays an important role in salvage surgery and keeps evolving.

See Article page 20.

Failure trial,³ which demonstrated improved survival among patients with severe acute respiratory distress syndrome. The Extracorporeal Life Support Organization was established in the United States in 1989 to provide support to institutions delivering ECMO, and currently its registry includes more than 170 centers from 54 countries around the world. The Extracorporeal Life Support Organization 2016 international summary reported that the number of adult ECMO cases in the registry was 19,331.⁴ Therefore it is critical for cardiothoracic surgeons and cardiologists who treat very sick populations requiring ECMO therapy to learn the history and basic mechanism of ECMO and to update their knowledge of the latest technology and clinical outcomes.

For respiratory failure, venovenous ECMO predominates (78%) in adult patients,² and the rate of survival to discharge or transfer is nearly 60%.⁴ On the other hand, the survival rate of patients requiring so-called cardiac ECMO for circulatory support remains as low as 41%.⁴ Thus, further development of ECMO technology is awaited for patient populations such as this. Nearly 95% of cardiac ECMO is provided by the venoarterial configuration. The major disadvantages of venoarterial ECMO therapy are afterload increase and insufficient left ventricular unloading.⁵

It is important to mention the introduction of the Impella device (Abiomed Inc, Danvers, Mass) in the field of mechanical support therapy. This percutaneous ventricular assist device technology is designed to provide percutaneous/endovascular circulatory support. Although it is still in the development phase and might not be able to provide enough flow to solely maintain full circulation, it is clearly a good tool to decompress an overloaded left ventricle in the setting of advanced heart failure with peripheral venoarterial ECMO. There are emerging reports of hybrid ECMO configurations that combine venovenous ECMO with the Impella 2.5/CP/5.0 to support a failing heart and/or

lung with promising results.⁶⁻⁸ Further assessments of the percutaneous ventricular assist device and the hybrid technique are necessary, and further improvement of the technology in terms of device profile and flow should be on its way. It seems that conventional ECMO technology keeps evolving and we are entering a new era.

ECMO therapy has evolved over the past decade, but its outcomes are still unsatisfactory. ECMO therapy is often a salvage procedure and the target population for its use has an expected mortality of nearly 100% without ECMO initiation. The outcomes of ECMO therapy for salvage may not be appropriate for evaluating the true value of the therapy by percent survival. The indications for ECMO therapy may change with the further development of percutaneous ventricular assist devices such as Impella that have greater flow capability.

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