

Chapter 2

EXTRACORPOREAL MEMBRANE OXYGENATION

Mihriban YALÇIN¹

INTRODUCTION

Extracorporeal membrane oxygenation (ECMO) is an assist device for providing prolonged but temporary cardiac or respiratory support. While in patients with normal heart function veno-venous (VV) ECMO is sufficient for respiratory support, in acute heart failure veno-arterial (VA) ECMO should be applied.

ECMO is the smaller, closed and portable state of the standard cardiopulmonary bypass device. The cannulas are specially designed for ECMO. ECMO consists of nonpulsatile pump, membrane oxygenator, entry and exit cannula of flow. The mean duration of treatment required for most patients is 1 week.

HISTORY

Firstly, membrane oxygenator was formed in laboratory conditions in 1950s. (Gibbon, 1954) After successful application of the heart-lung machine in 1953 by Gibbon, Hill et al. was treated a 24 - year - old patient who had undergone aortic transection after traffic accident with femoro-femoral venoarterial ECMO for 3 days in 1971. (Hill, O'Brien & Murray)

MECHANISM OF ECMO

Blood is drawn from the venous circulation. Oxygenation increases, carbon dioxide decreases. Blood is given back to the patient's venous or arterial circulation. ECMO is used as a temporary support unit to prevent organ damage in patients with pulmonary or cardiac failure (or both) when there is no other treatment option or failure. ECMO is a modification of the cardiopulmonary bypass pump, which is mainly used routinely in cardiac surgery.

INDICATIONS:

ECMO indications can be analyzed in two separate titles; cardiac and respiratory-induced causes. ECMO can be applied in 2 ways: VA and VV. (Ayık & et al.,2014)

¹ MD, Ordu State Hospital Department of Cardiovascular Surgery, mihribandemir33@hotmail.com

operative periods. It is an expensive therapy and is only available at a limited number of centers, some critically ill patients who otherwise had no chance of survival, may benefit from this treatment

REFERENCES:

1. Ayık MF & et al.(2014) Kalp Cerrahisinde Ekstrakorporeal Membran Oksijenasyonu (ECMO) Kullanımının Genişlemekte Olan Endikasyonları. *Turkiye Klinikleri J Cardiovasc Surg-Special Topics*, 6(2),97-101.
2. Bartlett RH & Gattinoni L (2010) Current status of extracorporeal life support (ECMO) for cardiopulmonary failure. *Minerva Anestesiol*,76,534-40.
3. Doll N & et al. (2004) Five-Year results of 219 consecutive patients treated with extracorporeal membrane oxygenation for refractory postoperative cardiogenic shock. *Ann Thorac Surg.*,77(1),151-7.
4. Finney S. J (2014) Extracorporeal support for patients with acute respiratory distress syndrome. *European Respiratory Review*,23,379-89.
5. Gibbon Jr JH. (1954) Application of a mechanical heart and lung apparatus to cardiac surgery. *Minn Med*,37(3),171-85
6. Goldstein DJ & Oz, MC (2000) Mechanical support for postcardiotomy cardiogenic shock. *Semin Thorac Cardiovasc Surg*,12,220- 28.
7. Hill JD & et al., (1972) Prolonged extracorporeal oxygenation for acute post-traumatic respiratory failure (shock-lung syndrome). Use of the Bramson membrane lung. *N Engl J Med*,286(12),629-34.
8. Knapp K & et al., (2016) Spontaneous, Postpartum Coronary Artery Dissection and Cardiogenic Shock with Extracorporeal Membrane Oxygenation Assisted Recovery in a 30-Year-Old Patient. *Case Reports Cardiol.*, 2016,1-4.
9. Ko WJ & et al., (2002) Extracorporeal membrane oxygenation support for adult postcardiotomy cardiogenic shock. *Ann Thorac Surg*,73,538-45.
10. Loforte A & et al., (2011) Levitronix CentriMag third-generation magnetically levitated continuous flow pump as bridge to solution. *ASAIO J*,57,247-53.
11. Magovern GJ Jr & et al., (1994) Extracorporeal membrane oxygenation: preliminary results in patients with postcardiotomy cardiogenic shock. *Ann Thorac Surg*,57,1462-68.
12. Marasco SF & et al., (2005), Early institution of mechanical support improves outcomes in primary cardiac allograft failure. *J Heart Lung Transplant*,24 (12),2037-42.
13. Rastan AJ & et al., (2010)Early and late outcomes of 517 consecutive adult patients treated with extracorporeal membrane oxygenation for refractory postcardiotomy cardiogenic shock. *J Thorac Cardiovasc Surg*, 139,302-11.
14. Russo CF & et al., (2010) Venoarterial extracorporeal membrane oxygenation using Levitronix centrifugal pump as bridge to decision for refractory cardiogenic shock. *J Thorac Cardiovasc Surg*,140, 1416-21.
15. Smedira NG & et al., (2001) Clinical experience with 202 adults receiving extracorporeal membrane oxygenation for cardiac failure: survival at five years. *J Thorac Cardiovasc Surg*,93,92-102.
16. Smith C & et al. (2001) An extracorporeal membrane oxygenation-based approach to cardiogenic shock in an older population. *Ann Thorac Surg*,71,1421-27.
17. Vanzetto G & et al., (2009)Prevalence, therapeutic management and medium-term prognosis of spontaneous coronary artery dissection: results from a data base of 11,605patients. *Eur J Cardiothorac Surg*, 35(2),250-54.