

## Extra Corporeal Membrane Oxygenation

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### *Abstract:*

Extracorporeal membrane oxygenation, also known as extracorporeal life support is an extracorporeal technology that provides long term cardiac & respiratory support to heart & lungs which cannot provide enough oxygen, air exchange or blood transfusion needed to survival.

Extra Corporeal Membrane Oxygenation is a type of life support used for successful management of ARDS. In 2009 it was used for successful management of severe ARDS during H1N1 influenza epidemic.

A multicenter matched COHORT comparative study was carried between ECMO vs Conventional Mechanical Ventillation for severe acute respiratory failure patients due to covid 19 among large US hospital network between March 2020 to October 2021. Results of the study revealed that 10,571 patients met study criteria and after matching, 275 ECMO patients and 5,808 conventional IMV patients were available for comparison. ECMO was associated with a significant mortality reduction, 36% versus 61% (odds ratio [OR] 0.44, 95% confidence interval [CI] 0.34-0.57). Compared to conventional IMV survivors, ECMO survivors were significantly more likely to be discharged to acute rehabilitation than long term acute care (relative risk ratio (RRR) 2.23, 95% CI 1.16-4.32). ECMO survivors were also significantly more likely to be discharged to another acute care hospital for further management (RRR 3.21, 95% CI 1.75-5.92)

ECMO is a form of extra corporeal life support machine where an external artificial circulation carries venous blood from patient to a gas exchange device (Oxygenator) where blood is enriched with oxygen and is recirculated to patients system. This is achieved using a pump either centrifugal or a roller pump.

### **Evolution of ECMO**

Extracorporeal membrane oxygenation (ECMO) has made significant advances in recent years. This has become a very important tool for the treatment of adults and children with severe heart disease and cancer that do not respond to conventional treatment (1,2). Today, ECMO has become more reliable due to better equipment and more experience, which is reflected in better outcomes

ECMO was developed in 1950s by John Heysen Gibbon an American surgeon and C

Walton Lillehei (father of Open Heart Surgery) and was first used among neonates in 1965. ECMO basically evolved from Cardio Pulmonary Bypass Machine.

### **Indications**

Severe Hypoxemia ( $PaO_2/FiO_2 < 80$  despite 15-20cm PEEP for atleast 6 hours in potentially reversible respiratory failure)

Uncompensated hypercapnia ( $pH < 7.1$ ) in spite of optimal management Very high end-inspiratory plateau pressure ( $> 35-40$ cmH<sub>2</sub>O) despite optimal ventilator management

**Contra indications**

A very high end inspiratory plateau pressure (>35-40cmH2O) or an FiO2 (>80%) for 07 days

Unavailable or limited access

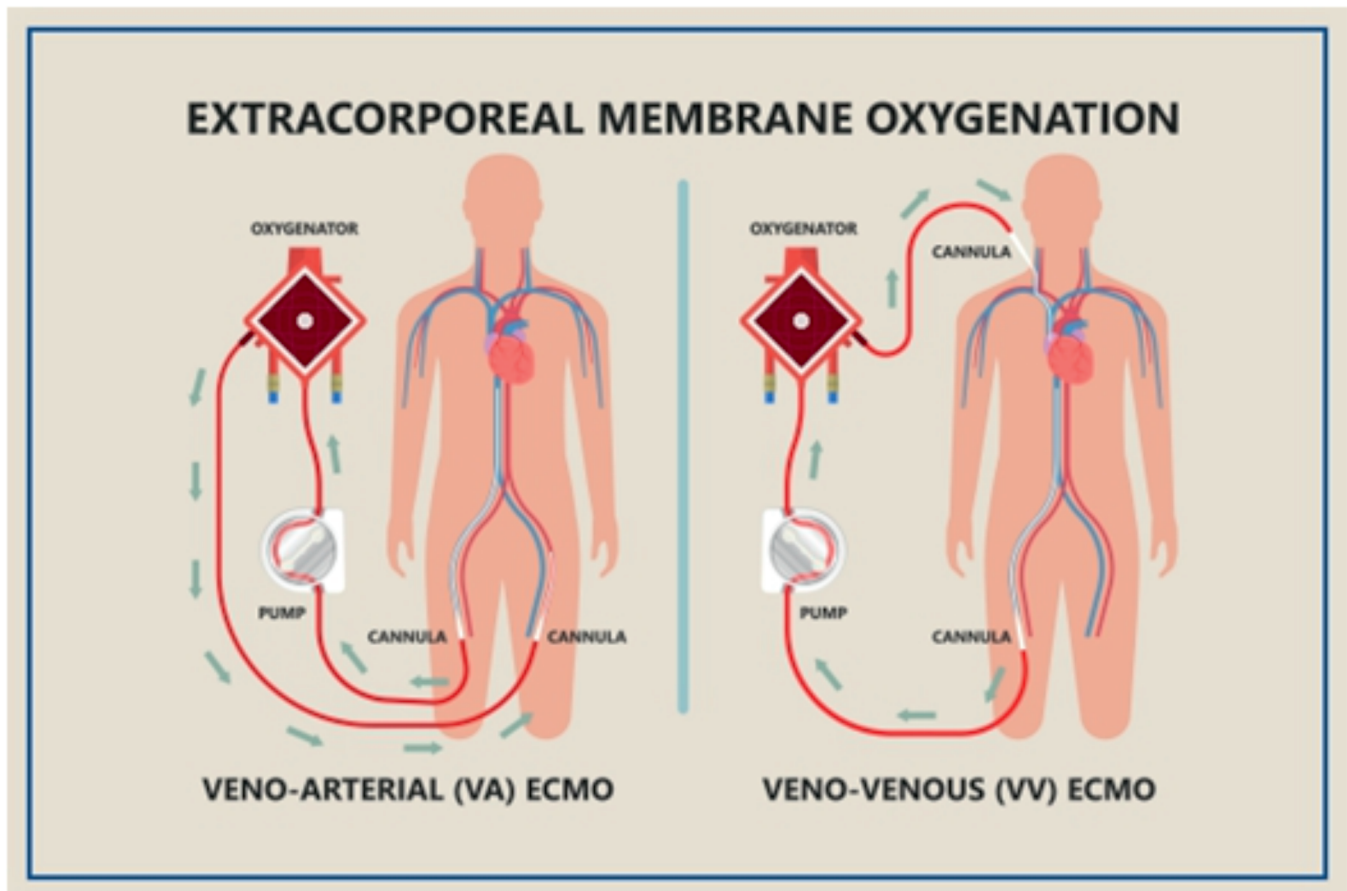
Irreversible oxygen dysfunction

Any condition that contraindicates the usage of anticoagulants

**Types of ECMO**

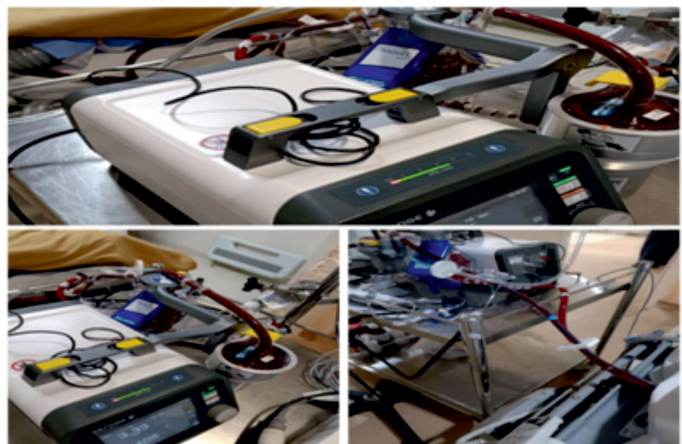
Veno Venous ECMO

Veno Arterial ECMO



**Parts of ECMO**

- ECMO Cannulae
- Oxygenator
- Sensor
- Centrifugal Pump
- Rotaflow drive
- Rotaflow emergency hand crank
- Pump Console
- Heater/ Cooler Machine
- Pressure Monitoring Unit



### Complications of ECMO

Thrombus formation  
Cannula Malposition  
Sepsis  
Hemorrhage

### Critical Observations

Physician to be consulted immediately for the following

PaO<sub>2</sub><60mm of Hg  
SVO<sub>2</sub> <60% or >80%  
SBP<90mm Hg  
CI<2.5L/min/m<sup>2</sup>  
Decreased LOC(independent of sedation)  
Unilateral diminished Breath sounds  
Diminished/loss of pulses in extremity (in arterial cannulation)  
Obvious bleeding in cannulation sites  
Positive occult blood in NG drainage, stool & urine  
Urine output<20ml/hour for 2 hours

### Conclusion

The cost of ECMO treatment in India varies by hospital as well as by kind of treatment and machine configuration. In India, the average cost of an ECMO equipment is more than 35 lakhs INR, and the daily procedure charges range from 1.5 lakhs to 3 lakhs INR.

ECMO treatment has gained much popularity in the last decade with the rise of many heart and lung-related diseases. While it does pose certain risks, ECMO treatment is almost always effective and has helped save many lives.

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