World Academy of Science, Engineering and Technology
International Journal of Medical and Health Sciences
Vol:17, No:11, 2023

Extracorporeal Co2 Removal (Ecco2r): An Option for Treatment for Refractory Hypercapnic Respiratory Failure

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Abstract : Acute respiratory distress syndrome (ARDS) is a common serious condition of bilateral lung infiltrates that develops secondary to various underlying conditions such as diseases or injuries. ARDS with severe hypercapnia is associated with higher ICU mortality and morbidity. Venovenous Extracorporeal membrane oxygenation (VV-ECMO) support has been established to avert life-threatening hypoxemia and hypercapnic respiratory failure despite optimal conventional mechanical ventilation. However, VV-ECMO is relatively not advisable in particular groups of patients, especially in multi-organ failure, advanced age, hemorrhagic complications and irreversible central nervous system pathology. We presented a case of a 79-year-old Chinese lady without any pre-existing lung disease admitted to our hospital intensive care unit (ICU) after acute presentation of breathlessness and chest pain. After extensive workup, she was diagnosed with rapidly progressing acute interstitial pneumonia with ARDS and hypercapnia respiratory failure. The patient received lung protective strategies of mechanical ventilation and neuromuscular blockage therapy as per clinical guidelines. However, hypercapnia respiratory failure was refractory, and she was deemed not a good candidate for VV-ECMO support given her advanced age and high vasopressor requirements from shock. Alternative therapy with extracorporeal CO2 removal (ECCO2R) was considered and implemented. The patient received 12 days of ECCO2R paired with muscle paralysis, optimization of lung-protective mechanical ventilation and dialysis. Unfortunately, the patient still had refractory hypercapnic respiratory failure with dual vasopressor support despite prolonged therapy. Given failed and futile medical treatment, the family opted for withdrawal of care, a conservative approach, and comfort care, which led to her demise. The effectivity of extracorporeal CO2 removal may depend on disease burden, involvement and severity of the disease. There is insufficient data to make strong recommendations about its benefit-risk ratio for ECCO2R devices, and further studies and data would be required. Nonetheless, ECCO2R can be considered an alternative treatment for refractory hypercapnic respiratory failure patients who are unsuitable for initiating venovenous ECMO.

Keywords : extracorporeal CO2 removal (ECCO2R), acute respiratory distress syndrome (ARDS), acute interstitial pneumonia (AIP), hypercapnic respiratory failure
Conference Title : ICACCM 2023 : International Conference on Anesthesiology and Critical Care Medicine
Conference Location : Kyoto, Japan
Conference Dates : November 20-21, 2023