Venovenous Extracorporeal Membrane Oxygenation

Gas Exchange, the Membrane Lung, and the Ventilator

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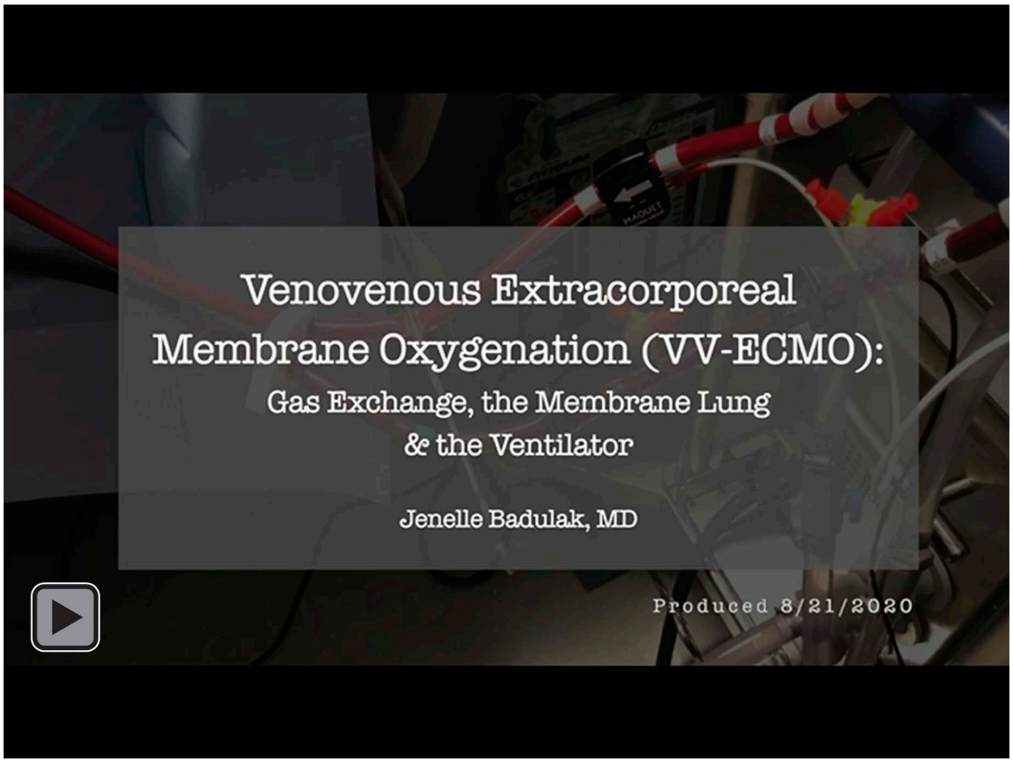
This video serves as a resource for novice venovenous extracorporeal oxygenation (ECMO) providers to understand the fundamentals of gas exchange, the membrane lung (ML) (also called the oxygenator), and use of the ventilator. Adjustments to speed/blood flow and fraction of delivered oxygen percent



Video 1. Instructional video for venovenous extracorporeal membrane oxygenation (ECMO) including gas exchange, the membrane lung, and management of the ventilator. Image(s) used with permission from CollectedMed, LLC.

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(Fd_{O2}) affect oxygenation, and changes to sweep gas flow rate affect CO_2 removal. Hypercarbia is treated by increasing the sweep gas flow rate. A common goal for oxygen saturation as measured by pulse oximetry during venovenous ECMO is >88%, which can be lowered, if necessary, to avoid injurious ventilator settings, as long as there is no evidence of tissue hypoxia. Hypoxemia is addressed by increasing the ECMO blood flow rate, which is limited by circuit pressure extremes and recirculation. Pathologic recirculation occurs when blood from the return cannula is sucked into the drainage cannula instead of flowing through the native heart, leading to hypoxemia. This corresponds with a rising premembrane oxygen saturation with a falling oxygen saturation as measured by pulse oximetry on the patient as well as bright red drainage and return tubing. Circuit gas exchange failure is due to either sweep gas flow interruption or ML failure. ML failure is due to problems with ML microtubules and is detected using pre- and postmembrane blood gases. Rising delta P and visualized clot on the ML window can herald blood phase ML failure. Sweep gas flow interruption or severe ML failure results in both drainage and return tubing appearing dark. Ventilator settings are deescalated to avoid ventilator-induced lung injury while awaiting pulmonary recovery.

Author disclosures are available with the text of this article at www.atsjournals.org.

RECOMMENDED READING

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