

ELSA Publication Brief: (ELS9680AClements)

Measurements of recirculation during neonatal veno-venous extracorporeal membrane oxygenation: clinical application of the ultrasound dilution technique State Univ of NY Upstate Medical Center

OBJECTIVE

To report the first clinical application of ultrasound dilution technology's capability to quantify recirculation during neonatal venovenous extracorporeal membrane oxygenation (VV ECMO) and to study various aspects of using ultrasound dilution to quantify recirculation.

METHOD

- A 2.8 kg male neonate born with congenital diaphragmatic hernia was placed on VV ECMO using a single 12 Fr. dual lumen cannula inserted into the right atrium through the internal jugular vein.
- Ultrasound dilution sensors were applied to the arterial and venous lines of the ECMO circuit near the dual lumen cannula.
- A 3-5 ml bolus injection of room temperature normal saline was injected into the extracorporeal circuit.
- During the 12-day VV ECMO run, 86 recirculation measurements were performed under a variety of conditions.
- Measurements using injections of platelet concentrates were compared with those made with saline.

RESULTS

- The average recirculation measurement was 34.3% and ranged from 15-57%.
- The reproducibility of recirculation measurements performed within five minutes of one another was within 5.6% of each other.
- Changes in patient positioning resulted in significant changes in recirculation.
- Measurements of platelet injection correlated closely with saline injections (mean difference, .25% +/- 2.8%).

CONCLUSION

In this initial case experience, ultrasound dilution technique provided quick, reproducible bedside results that showed changes in recirculation associated with VV ECMO therapy. Application of this technique could provide early data that will assist the clinician in guiding interventions to minimize recirculation.

DISCUSSION

VV ECMO recirculation occurs when a portion of the oxygenated blood that is delivered to the patient through a double-lumen catheter's arterial lumen immediately flows back into the venous lumen and, therefore, doesn't circulate within the patient. Excessive recirculation will result in suboptimal oxygen delivery to the patient. This paper shows that ultrasound dilution technology can be used to quantify recirculation in neonates on VV ECMO.

REFERENCE

Clements D, Primmer J, Ryman P, Marr B, Searles B, Darling E. "Measurements of recirculation during neonatal veno-venous extracorporeal membrane oxygenation: clinical application of the ultrasound dilution technique." J Extra Corpor Technol. 2008;40(3):184-7.

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