A pilot study identifying brain-targeting adaptive immunity in pediatric ECMO patients with acquired brain injury

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Abstracts will be considered for both poster and platform presentations

Stroke/Neurovascular

Objective: Extracorporeal Membrane Oxygenation (ECMO) provides short-term cardiopulmonary life support, but is associated with peripheral innate inflammation, disruptions in cerebral autoregulation, and acquired brain injury. We tested the hypothesis that ECMO also induces central nervous system (CNS)-directed adaptive immune responses which may exacerbate ECMO-associated brain injury.
Design: A single center prospective observational study
Setting: Pediatric and Cardiac Intensive Care Units at a single tertiary care, academic center
Patients: 20 pediatric ECMO patients (0-14 years; 13 females, 7 males) and 5 non-ECMO pediatric logistic organ dysfunction score (PELOD)-matched patients
Measurements and Main Results: Venous blood samples were collected from the ECMO circuit at day 1 (10-23 hrs), day 3, and day 7 of ECMO. Flow cytometry quantified circulating innate and adaptive immune cells, and CNS-directed autoreactivity was detected using an in vitro recall response assay. Disruption of cerebral autoregulation was determined using continuous bedside near-infrared spectroscopy (NIRS), and acquired brain injury confirmed by MRI. ECMO patients with acquired brain injury (n=9) presented with a ten-fold increase in IL-8 over ECMO patients without brain injury ($p<0.01$). Furthermore, brain-injury within ECMO patients potentiated an inflammatory phenotype in adaptive immune cells and selective autoreactivity to brain peptides in circulating B cell and cytotoxic T cell populations. Correlation analysis revealed a significant relationship between adaptive immune responses of ECMO patients with acquired brain injury and loss of cerebral autoregulation.
Conclusions: We show that pediatric ECMO patients with acquired brain injury exhibit an induction of pro-inflammatory cell signaling, a robust activation of adaptive immune cells, and CNS-targeting adaptive immune responses. As these patients experience developmental delays for years after ECMO, it is critical to identify and characterize adaptive immune cell mechanisms that target the developing CNS.