



Poster Session I (cont.)

P10

EX VIVO COMPARISON OF EXTRACORPOREAL MEMBRANE OXYGENATION CIRCUITS AND CANNULAE TO EVALUATE SOURCES OF HEMOLYSIS

Julie Monteagudo, MD, Ciaran O'Brien, BA, Christine A. Schad, MD, Francesca Rapido, MD, Kenmond Fung, CCP, Michael Brewer, CCP, David A. Bateman, MD, MS, William Middlesworth, MD.

Columbia University Medical Center, New York, NY, USA.

Purpose:

Hemolysis, as measured by plasma free hemoglobin (PFH), is a significant problem in neonates requiring ECMO that can result in pigment nephropathy, neurologic disability, and end organ dysfunction. Limited information exists about which components of the ECMO circuit cause the most hemolysis. The purpose of the study was to examine the effects of oxygenators and neonatal ECMO cannulae in an *ex vivo* centrifugal pump model.

Methods:

Experiment 1: centrifugal pump with adult oxygenator and shunt (C1), a centrifugal pump with pediatric oxygenator (C2), and a centrifugal pump for cardiac ECMO with pediatric oxygenator (C3). Experiment 2: centrifugal pump with venous and arterial cannulae used in peripheral cannulation (C4), centrifugal pump with dual lumen venovenous cannula (C5) and centrifugal pump for transport with venous and arterial cannulae used in central cannulation (C6). Whole blood was reconstituted and washed before dividing between the experimental circuits. RPMs were titrated to a flow of 450mL/min to simulate flows for a 3kg neonate. PFH was assessed at regular intervals over 24 hours. Rate of hemolysis for each circuit configuration was statistically analyzed.

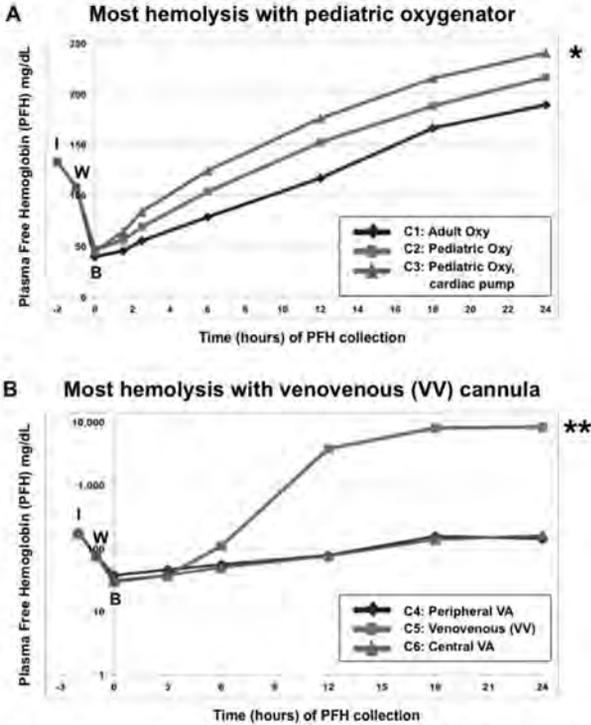
Results:

Washing of pooled blood reduced the PFH from 154mg/dL to 90mg/dL. PFH was similar for all six configurations at the initial time point (43.4mg/dL). In Experiment 1, the circuit with the adult oxygenator and shunt produced the least hemolysis, significant by multiple linear regression analysis ($p < 0.01$) (Figure A). In Experiment 2, single lumen venoarterial cannulae for peripheral or central cannulation were not significantly different ($p = 0.8$), however, hemolysis was accelerated through the dual lumen venovenous cannula compared to either single lumen configuration ($p < 0.005$) (Figure B).

Conclusions:

Adult oxygenators produced less hemolysis than pediatric oxygenators. The dual lumen venovenous cannula produced more hemolysis than single lumen cannulae for peripheral or central cannulation. Further experiments and analysis of ELSO registry data are planned.

Poster Session I (cont.)



A. Comparison of centrifugal pumps with adult or pediatric oxygenator. Initial (I) Plasma Free Hemoglobin (PFH); Washed (W) PFH, Baseline (B) PFH. Cardiac centrifugal pump with pediatric oxygenator produced the most hemolysis (C3) ($p < 0.01$, *).

B. Comparison of peripheral VA cannula (C4), dual lumen venovenous (VV) cannula (C5), and central VA cannulae (C6). Circuit with VV cannula (C5) produced the most hemolysis ($p < 0.005$, **).