Abstract:

**Background:** Hemodilution is a concern in cardiopulmonary bypass (CPB). Using smaller dual tubing rather than a single larger inner diameter (ID) tubing in the venous limb to decrease prime volume has been a standard practice for decades in our country. The purpose of this study is to evaluate this unique practice.

**Methods:** Four different CPB circuits primed with lactated Ringer’s solution and packed red blood cells (hematocrit 30%) were investigated. Two setups were used with two circuits for each. In setup I, a neonatal oxygenator was connected to dual 3/16” ID venous limbs (circuit A) or to a single 1/4” ID venous limb (circuit B); and in setup II a pediatric oxygenator was connected to a dual 1/4” ID venous limbs (circuit C) or a single 3/8” ID venous limb (circuit D). Trials were conducted at arterial flow rates of 500 ml/min up to 1500ml/min (setup I) and up to 3000ml/min (setup II) at 36oC and 28oC. Real-time venous line pressure along with arterial and venous limbs flows data were recorded.

**Results:** Circuit B exhibited a higher venous flow rate when compared to circuit A in both sets of temperature conditions and had 5ml less measured prime volume. Circuit D exhibited a higher venous flow rate when compared to circuit C, at both temperatures, with an insignificant 10ml increase in prime volume. The flow resistance was significantly higher in circuits A and C compared to circuits B (p<0.001) and D (p<0.001), respectively.

**Conclusion:** A single ¼” venous limb is better than a dual 3/16” venous limb at all flow rates up to 1500ml/min. Moreover, a single 3/8” venous limb is better than a dual ¼” venous limb up to 3000ml/min. Our findings strongly suggest a revision of perfusion practice in Brazil to include single venous limb circuits for cardiopulmonary bypass.