

Different pulse pressure variations in predicting fluid responsiveness in children after cardiac surgery for ventricular septal defect or tetralogy of Fallot

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Introduction: Pulse pressure variation (PPV) derived from pressure record analytical method (PRAM) is based on heart-lung interaction during mechanical ventilation. We have shown that PPV is predictive of fluid responsiveness in children after surgical repair of ventricular septal defect (VSD). The preoperative pulmonary vasculature in tetralogy of Fallot (TOF) is underdeveloped as compared to that in VSD. In some of the TOF patients with severe pulmonary arterial stenosis and even more poorly developed pulmonary vasculature, Blalock-Taussig shunt is performed instead of complete repair. Postoperative pulmonary blood flow relative to the development of pulmonary vasculature in the three groups of patients would affect heart-lung interaction and therefore PPV.

Methods: VSD (VSD group, n=38, 1.1±0.8 years) and TOF (TOF-repair group, n=36, 1.2±0.7 years) infants undergone complete repair, TOF infants undergone Blalock-Taussig shunt procedure (TOF-BT group, n=24, 1.3±1.2 years) clinically present low cardiac output were enrolled. 5% albumin or blood plasma was given over 15 minutes. PPV was recorded using PRAM along with cardiac index (CI) before and after volume replacement. Patients were considered as responders to fluid loading when CI increased ≥15%.

Results: The overall PPV was the lowest in TOF-BT group, and less so in TOF-repair group as compared to that in VSD group (10.7±2.7%, 15.2±4.4%, 19.3±4.4%, respectively, P<0.01). In VSD group, 27 were responders and 11 non-responders. Area under the curve (AUC) was 0.89 (95% confidence interval, 0.77~1.01, P<0.01) and cutoff value 17.4% with a sensitivity of 0.89 and a specificity of 0.91. In TOF-repair group, 26 were responders and 10 non-responders. AUC was 0.79 (95% CI, 0.64~0.94, P=0.01) and cutoff value 13.4% with a sensitivity of 0.81 and a specificity of 0.80. In TOF-BT group, 15 were responders and 9 non-responders. AUC was 0.81 (95% CI, 0.61~0.97, P=0.01) and cutoff value 9.5% with a sensitivity of 0.80 and a specificity of 0.78.

Conclusion: The degree of PPV and cutoff values are different among the three groups of patients. This should be paid attention to in clinical practice in order to avoid both under- and over-estimate fluid requirement in different congenital heart defects.