

Different prediction of fluid responsiveness by pulse pressure variation in children after surgical repair of ventricular septal defect or Tetralogy of Fallot

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Introduction: Volume expansion therapy is considered the first-line treatment in children after cardiopulmonary bypass (CPB), but excessive volume is harmful. Pulse pressure variation (PPV) derived from pressure record analytical method (PRAM) is based on heart-lung interaction during mechanical ventilation. The heart-lung interaction might be different between ventricular septal defect (VSD) and Tetralogy of Fallot (TOF) due to different right ventricular function and pulmonary vasculature, potentially affecting the predictability of fluid responsiveness using PPV after surgical repair.

Method: Children undergoing CPB for complete repair of VSD (Group VSD, n=29, aged 0.7 ± 0.2 years) and TOF (Group TOF, n=36, aged 0.8 ± 0.3 years) were enrolled. After CPB and before chest closed, mechanical ventilation was set with tidal volume 10 ml/kg. 5% albumin or blood plasma routinely was given ($16\text{ ml}\cdot\text{kg}^{-1}\cdot\text{h}^{-1}$) over 15 minutes. PPV was recorded using PRAM along with heart rate (HR), stroke volume index (SVI), cardiac index (CI) before and after volume replacement. Patients were considered as responders to fluid loading when CI increased $\geq 15\%$.

Results: In Group VSD, 12 were responders and 14 non-responders. PPV in responders was higher than that in non-responders ($25.7\pm 6.4\%$ vs. $16.6\pm 5.0\%$, $P<0.01$). Area under the curve (AUC) was 0.85 (95% confidence interval, 0.69~1, $P=0.01$) and cutoff value 19% with a sensitivity of 92% and a specificity of 71%. In Group TOF, 15 were responders and 21 non-responders. PPV in responders were not different from that in non-responders ($11.6\pm 4.6\%$ vs. $10.1\pm 2.0\%$, $P>0.1$). AUC was 0.52 (95% confidence interval, 0.31~0.72, $P=0.01$).

Conclusion: PPV by PRAM can be used to predict fluid responsiveness in children after surgical repair of VSD, but not in children with TOF.