

High post-capillary pressure reduces the efficacy of pulmonary vasodilator in Fontan patients

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Background.

Efficacy of pulmonary vasodilator is limited in Fontan circulation. We predicted that elevation of post-capillary pressure, namely increased pressure of pulmonary-capillary wedge (PCWP) or increased end-diastolic pressure of ventricle (EDP), subsists mostly in Fontan patients with high central venous-pressure (HCVP).

Methods.

The medical records of 139 Fontan patients were reviewed. They underwent cardiac catheterizations and blood tests between 2010 and 2015. First, we investigated clinical characters in patients with pulmonary vasodilator (n=55). Second, we divided the whole into patients with CVP 16 mmHg or over (HCVP: n=21) and those without HCVP (n=118). Related factors to HCVP were set up by square test. Third, we compared retention rate of these factors between vasodilator patients with HCVP (n=9) and without HCVP (n=46).

Results.

Fontan patients with Vasodilator possessed following medical histories more than those without Vasodilator: coil embolizations (80% vs. 61%, p=0.024), percutaneous transluminal pulmonary angioplasty (50% vs. 27%, p=0.0048), and repair of atrio-ventricular valve (30% vs. 14%, p=0.018). They had small pulmonary artery index (≤ 180 mm²/m²) more (41% vs. 16%, p=0.0010). In monovariate analysis HCVP in all 139 patients was associated with 5 factors: PCWP ≥ 11 mmHg (52% vs. 2%, p<0.00001), EDP ≥ 12 mmHg (42% vs. 10%, p=0.00042), pulmonary artery index ≥ 370 mm²/m² (19% vs. 3%, p=0.019), ventricular volume on end-diastole $\geq 117\%$ (57% vs. 29%, p=0.027), ventricular volume on end-systole $> 46\%$ (71% vs. 44%, p=0.037). In Vasodilator group, patients with HCVP owned either of PCWP ≥ 11 mmHg or EDP ≥ 12 mmHg (high post-capillary pressure) much more than those without HCVP (77% vs. 10%: p< 0.0001). However, the ratio of patients with extended ventricular volume (On end-diastole $\geq 117\%$ or On end-systole $> 46\%$) was not significantly different between vasodilator patients with HCVP and without HCVP (77% vs. 54%). Similarly, the ratio of Vasodilator patients with large pulmonary artery index was not different.

Conclusion.

Most of Fontan patients with Vasodilator who had still HCVP possessed increased PCWP or increased EDP. Subsisting of high post-capillary pressure might be one of the reasons why vasodilator does not respond to high CVP so much in Fontan patients.