We should note that lower pressure of pulmonary capillary wedge than we expected lifts up central venous pressure in Fontan circulation

【Background】

In patients with bi-ventricle who have chronic heart failure increased post-capillary pressure, such as high pressure of pulmonary capillary wedge (PCWP), provokes pulmonary hypertension. High PCWP are induced by decreased left-cardiac functions. In Fontan patients with mono-ventricle high central-venous pressure (high CVP) impair Fontan circulation. We predicted that increased PCWP in Fontan heart also induced high central-venous pressure (high CVP), and that high PCWP was caused by various factors which subsisted before Fontan procedure.

【Objective】

We investigated values of PCWP which caused high CVP in Fontan patients and backgrounds for high PCWP.

【Methods】

Subjects and examinations. The medical records of 174 Fontan patients were reviewed from 2 yrs to 18 yrs. They underwent cardiac catheterizations and blood tests between 2010 and 2015. Comparative methods. We defined CVP 16 mmHg or over as high CVP (CVP ≥ 16 mmHg). First, we examined whether the area under a receiving operating characteristics curve (AUROC) was deemed meaningful by calculating PCWP for predicting high CVP. Second, we sought minimum PCWP which was connected with high CVP. Using minimum PCWP we calculated following values with a standard formula to predict high CVP, such as positive and negative predictive value, sensitivity, and specificity. In addition, cardiac factors were searched for by AUROCs which were related to minimum PCWP. Third, We searched for clinical factors which made PCWP rising.

【Results】

We drew the AUROC for predicting high CVP to gain quite a positive one. AUROCs were 0.907 (95%CI:0.829-0.970) to predictive CVP 16 mmHg. Moreover, significant patient rate differences between high CVP and non-high CVP were related to minimum PCWP. Clinical factors, which were associated PCWP increasing, were flollows: A VVR (+), AR (+), Systolic Ao (mmHg), Rs (U’ · m2), PAI (mmHg), mitral regurgitation, and end-systolic pressure. Clinical functions would be connected with PCWP elevation. Practically, we should note that lower pressure of pulmonary capillary pressure, such as end-diastolic ventricular pressure, might cause high PCWP.

【Discussion】

Major findings. First, AUROC for predicting high CVP was fairly large by means of PCWP in Fontan circulation. The values of 7.9 mmHg was possibly the minimum PCWP which would make CVP ≥16 mmHg. Second, this PCWP ≥7 mmHg was the value that derived very high negative predictive-value (95%) to predictive CVP ≥16 mmHg. Third, ventricular overload, particularly elevated SVEDP, were related to minimum PCWP. Clinical factors, which were associated PCWP increasing, were flollows: A VVR (+), AR (+), Systolic Ao (mmHg), Rs (U’ · m2), PAI (mmHg), mitral regurgitation, and end-systolic pressure. Clinical functions would be connected with PCWP elevation. Practically, we should note that lower pressure of pulmonary capillary pressure, such as end-diastolic ventricular pressure, might cause high PCWP.

In Fontan circulation PCWP which would make CVP rising is not so high than we expected. We should employ the strategy avoiding high PCWP in Fontan candidate patients to acquire adequate PCWP after procedure.