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High pulmonary-artery pressures in Glenn circulation are not provoked by scanty pulmonary vascular-bed but by elevated afterloads due to decreasing cardiac functions

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Introduction: We commonly consider that small pulmonary artery is connected with high pressures of superior vena cava (SVCP) in Glenn patients. So we employ a strategy of pulmonary high flow to grow pulmonary arteries as much as possible. However, we predict pulmonary high flow increases loads against heart, which would become afterloads against pulmonary arteries. These high afterloads would end up increasing SVCP. We investigated related factors to high SVCP in Glenn circulation.

Methods: The medical records of 139 Glenn patients were reviewed who were aged 9 months to 10 years. They underwent cardiac catheterization between 2010 and 2017. We defined High SVCP as SVCP 16 mmHg or over (n=34). Cardio-pulmonary indexes were determined which were connected with high SVCP.

Results: Pulmonary artery indexes were not different at all between two groups. The rate of patients with high levels of NT-pro BNP (≥ 800 pg/ml) was higher in Glenn patients with high SVCP. High SVCP in Glenn patients was significantly related to 5 cardio-pulmonary factors: end-diastolic ventricular volumes $\geq 175\%$ ($p=0.011$), end-diastolic ventricular pressures ≥ 12 mmHg (<0.0001), pulmonary capillary-wedge pressures (or left atrium pressures) ≥ 10 mmHg (<0.0001), pulmonary flow > 3.3 L/min/m² ($p=0.035$), and existence of additional flows on Glenn procedure ($p=0.010$). After multivariate analysis, high SVCP was independently associated with odds ratio of 7.6 for elevated pressure of pulmonary capillary wedge/left atrium pressures, 4.6 for increased ventricular pressures on end-diastole, and 3.7 for additional flow to pulmonary arteries. Explanatory coefficient was high (0.48) by these 5 factors. The ratios of internal medicines for heart failure, such as vasodilators and beta blockers, were not different between Glenn patients with and without high SVCP; amount doses of enalapril and carvedilol were not different at all between two groups.

Conclusion: Our study showed increased afterloads against pulmonary arteries which were caused by cardiac overloads provoked High SVCP in Glenn patients. So the strategies that produced pulmonary high flow to grow pulmonary arteries can introduce High SVCP in Glenn patients. In the case when we could no lessen pulmonary flow, we should set intense medical treatment for cardiac afterloads in advance.