Circulating blood volume positively correlates with cardiac output in Fontan patients.

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Introduction: Patients with chronic heart failure (CHF) are known to have more amount of circulating blood volume (CBV) than patients with normal heart. Fontan patients are characterized by low cardiac output, high central venous pressure (CVP), and high neurohormonal activity (NHA), like in patients with CHF. There have been few reports about the CBV of Fontan patients. The aim of this study is to examine the usefulness of CBV in interpreting hemodynamic parameters and NHA in the Fontan patients.

Methods: Between June 2013 and December 2014 we evaluated CBV in twenty six Fontan patients aged 14.3 - 50.8 years (median 24.4 years). The patients after extracardiac rerouting type of Fontan operation are 54 % of all patients, intraatrial grafting are 27 %, atriopulmonary connection are 12 % and intraatrial rerouting are 7 %. The CBV was measured by pulse dye densitometry using indocyanine green during the cardiac catheterization. CBV indices (CBVI, CBV/body surface area) were compared with hemodynamic parameters (cardiac output (CO), systemic vascular resistance (Rs), and CVP) obtained during the cardiac catheterization and plasma norepinephrine level (NE), plasma dopamine level (DA), logarithm of atrial and brain natriouretic peptides (log ANP and log BNP) as the NHA.

Results: The CBV of Fontan patient was 2.53-8.62 L (median 4.22 L) and CBVI was 1.86-4.76 L (median 2.39 L/m2). There are no relation between CBVI and type of Fontan operation. CBVI had significant negative correlation with log BNP (p < 0.05), NE (p < 0.01) and DA (P < 0.05). Moreover, CBV was found to have positive correlation with CO in our series, which might suggest the different mechanism from conventional CHF lies under the low output and high CVP state in Fontan circulation.

Conclusion: In our study, CBV of Fontan patient has negative correlation with NHAs and positive correlation with CO.