

Factors Associated with Renal Dysfunction in Adults with Fontan Circulation

Ono H., Hayashi T., Kato H.

National Center for Child Health and Development, Tokyo, Japan

Introduction:

It is not uncommon for adults with Fontan circulation to have multi-organ complications. However, only a few studies have described the frequency and degree of renal dysfunction in adult Fontan patients. This study aimed to elucidate factors associated with renal function in adult Fontan patients.

Methods:

We performed a retrospective chart review of 21 adult Fontan patients (age 29.9 ± 7.2 years, 13 males) who had undergone postoperative cardiac catheterization. Renal function was evaluated by calculating estimated glomerular filtration rate (eGFR) based on serum creatinine level at the cardiac catheterization. Demographic data and laboratory results including platelet counts, serum levels of total bilirubin and gamma-glutamyltranspeptidase, plasma brain natriuretic peptide (BNP) concentration, and arterial oxygen saturation (SaO_2) were collected. The hemodynamic measurements obtained by cardiac catheterization included central venous pressure (CVP), cardiac index (CI), and pulmonary vascular resistance (PVR). The correlation between eGFR and the aforementioned parameters was assessed.

Results:

Fontan procedures (4 atriopulmonary connection, 8 extracardiac conduit including 4 converted from atriopulmonary connection, and 9 lateral tunnel) were performed at the mean age of 8.9 ± 5.1 years. The time interval since the Fontan procedure was 20.3 ± 4.5 years. No patient had symptomatic renal failure, and eGFR was 94.6 ± 17.6 mL/min/1.73m². Fourteen patients (67%) were on either angiotensin converting enzyme inhibitors or angiotensin receptor blockers. Platelet counts were $140 \pm 37 \times 10^9$ /L, total bilirubin was 1.1 ± 0.5 mg/dL, gamma-glutamyltranspeptidase was 120.5 ± 98.3 IU/mL, BNP was 67.8 ± 142.6 pg/mL, and SaO_2 was $92.1 \pm 3.6\%$. As for hemodynamic measurements, CVP was 11.6 ± 2.2 mmHg, CI was 2.5 ± 0.7 L/min/m², and PVR was 1.9 ± 1.0 Wood units·m². A statistically significant correlation was found between eGFR and age at examination ($r=-0.51$, $p=0.017$), the time interval since the Fontan procedure ($r=-0.55$, $p=0.010$), CVP ($r=0.56$, $p=0.008$), and CI ($r=0.60$, $p=0.003$). There is no significant correlation between renal function and liver function.

Conclusions:

In adult Fontan patients, renal dysfunction is mild and rarely symptomatic. The degree of renal dysfunction is associated with hemodynamic integrity of Fontan circulation that is reflected in CVP and CI.