

Serial assessment of the aortic conformation and distensibility in long-term Fontan survivors

Hayama Y., Ohuchi H., Miyazaki A., Yazaki S., Yamada O.
National Cerebral and Cardiovascular Center, Osaka, Japan

Background

Several studies have reported that aortic dilation and increased stiffness of the aorta in patients with congenital heart disease, including Fontan (F) patients, which may be an important predictor of the cardiovascular morbidity and mortality. However, the serial change of the aortic properties in F patients has not been clarified.

Methods

Ninety three postoperative F patients (F operation ; 4.3 ± 3.4 years old, systemic ventricles ; right ventricle 49, left ventricle 32, and biventricle 12, respectively) and 66 control subjects (C ; 12.7 ± 7.1 years old) were included. All F patients underwent cardiac catheterization with aortography before and 1, 5, 10, 15 years after the operation (F0, F1, F5, F10, F15). We measured the diameters of the sinus of Valsalva (S), sinotubular junction (STJ), ascending aorta (AAo) and descending aorta (DAo) from the cine-angiogram, and calculated the ratios of the former three to DAo (S', STJ', AAO'). We also calculated the stiffness parameters of the ascending and descending aorta (β (AAo), β (DAo), respectively) with the corresponding systolic and diastolic pressures and changes in diameters.

Results

DAo were increased ($p < 0.001$) and S', STJ', and AAO' decreased over time ($p = 0.014, 0.001, <0.001$, respectively). However, S', STJ' and AAO' in Fs kept to be significantly larger than those in C (ex. AAO' ; F0 2.2 ± 0.4 , F1 2.1 ± 0.3 , F5 2.1 ± 0.4 , F10 2.0 ± 0.4 , F15 1.9 ± 0.4 , C 1.6 ± 0.2 , $p < 0.001$). β (AAo) in Fs transitionally increased and continued to be significantly larger than those in C (F0 2.1 ± 1.7 , F1 2.0 ± 1.3 , F5 2.0 ± 1.2 , F10 2.4 ± 1.5 , F15 3.5 ± 2.7 , C 1.3 ± 0.6 , $p < 0.01$). On the other hand, β (DAo) didn't show any serial nor between-group variation across F0, F1, F5, F10, F15 and C.

Conclusions

Before and long after operation, Fontan patients have the stiffened dilated ascending aorta in contrast with well-distensible descending aorta. This long-standing conformational abnormality slowly improves, but the stiffness of ascending aorta may progress.