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Children after Fontan surgery have liver hypoperfusion.

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Introduction:

Liver cirrhosis is one of the critical complications in patients after Fontan surgery. It is well accepted that liver cirrhosis is associated with reduced liver perfusion. Previous reports showed that MRI-based Intravoxel Incoherent Motion-diffusion imaging (IVIM) which evaluates the change in liver parenchymal perfusion can monitor disease progression of liver fibrosis and liver cirrhosis. IVIM parameters (D^* and f values) in the Liver were reported to correlate with the blood perfusion.

Hypothesis:

We hypothesized that children after Fontan surgery have liver hypoperfusion.

Materials and Methods:

Five consecutive patients after Fontan surgery who visited our cardiology clinic and 4 age-matched controls were enrolled in this study. IVIM parameters (D^* , D and f values) were compared between the Fontan and normal children. We calculated the cardiac output from the IVC and SVC flow volume using phase contrast method. MRI scans were performed with a 1.5-T MR imaging system (Signa HDxt, General Electric, U.S.A). IVIM parameters were calculated using a non-linear least square fit to the bi-exponential model curve, and four circular ROIs were placed manually within the right hepatic lobe.

Results:

Age at MRI scan was 12.8 ± 1.5 years old. Body weight was 40.0 ± 11.1 kg. Age at Fontan surgery was 2.6 ± 0.5 years old and post-operative time was 10.5 ± 1.5 years, and cardiac output was 2.61 ± 0.23 L/min/m². D^* and f values of IVIM in children after Fontan surgery were significantly lower than controls (see Table). There was no significant difference in D value (see Table).

Limitations:

The number of patients is small. This trial is the nonrandomized controlled one.

Conclusions:

Liver hypoperfusion exists in children after Fontan surgery. IVIM imaging may be a noninvasive and quantitative technique for monitoring disease progression of liver fibrosis and liver cirrhosis in patients after Fontan surgery.

[Table]

	Fontan	Control	p
D^* (10^{-3} mm ² /s)	30.8 ± 24.8	113.2 ± 25.6	<u>0.002</u>
D (10^{-3} mm ² /s)	1.07 ± 0.04	1.25 ± 0.16	0.11
f (%)	13.2 ± 3.1	22.4 ± 2.4	<u>0.001</u>