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Comparison of myocardial deformation and dyssynchrony in children with left and right ventricular morphology after the Fontan operation assessed by 2D speckle tracking

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Background:

Right ventricular morphology has been found to be associated with poorer clinical outcome and ventricular function in single ventricle patients after Fontan palliation. Using 2-dimensional speckle tracking (2DST), a method that can assess ventricular function independent of ventricular geometry, the aim of our study was therefore to compare global and regional deformation and intraventricular dyssynchrony (ID) between children with left and right ventricular morphology after Fontan operation.

Methods:

We compared global and regional longitudinal strain (S) and strain rate (SR) as well as ID between 29 patients with systemic right (group 1: age 7.7 ± 2.7 y, Δt Fontan to echo 5.3 ± 3.0 y) and 22 patients with systemic left (group 2: age 7.8 ± 4.8 y, Δt Fontan to echo 4.6 ± 4.2 y) ventricles. ID was calculated as the standard deviation of the time intervals from the beginning of the QRS interval to peak S for the 6 segments of the right ventricle (Yu index) as well as the delay of time to peak S between basal septal and lateral walls.

Results:

Global S (-18.5 ± 3.5 vs. -17.9 ± 3.2 %, $p = \text{NS}$) and global SR (-1.0 ± 0.2 vs. -1.0 ± 0.2 s⁻¹, $p = \text{NS}$) did not differ between groups. Regional S (-8.7 ± 8.6 vs. -14.7 ± 6.7 %, $p = 0.008$) and SR (-0.7 ± 0.4 vs. -1.0 ± 0.3 %, $p = 0.002$) in the basal septal segment were lower in group 1 while regional S was higher in group 1 in the apical septal segment (-23.5 ± 8.0 vs. -18.4 ± 5.9 %, $p = 0.02$). ID was not different (Yu index 43 ± 19 vs. 40 ± 24 ms, wall-to-wall delay 58 ± 49 vs. 54 ± 47 ms).

Conclusion:

Despite minor regional differences, overall ventricular deformation and dyssynchrony was not different between morphologic right and left ventricles. These findings may reflect similar adaptation of both ventricular morphologies to the single ventricle circulation in our cohort, albeit relatively early after Fontan surgery.