Biventricular response to pulmonary artery banding in children with dilated cardiomyopathy assessed by cardiac magnetic resonance strain analysis

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Objectives: Pulmonary artery banding (PAB) has been proposed as a novel therapy in infants with severe left sided dilated cardiomyopathy (DCM). Although potential mechanisms leading to improvement of left ventricular function have been suggested, the response of the right ventricle (RV) to increased afterload and its impact on left ventricular (LV) remodelling remains unknown. Our study aimed to assess changes in biventricular properties after PAB in severe left sided DCM using cardiac magnetic resonance (CMR) feature tracking (FT) analysis.

Methods: Thirteen patients who underwent central PAB due to severe DCM were evaluated using standard cine CMR measurements of cardiac size, mass and function. CMR-FT software was used to quantify biventricular longitudinal (LS), circumferential (CS) and radial (RS) strain including intraventricular synchrony before (mean age 5.8 ± 4.0 months) and after PAB (mean age 19.8 ± 11.3 months).

Results: LV enddiastolic (153 ± 54 to 65 ± 11 ml/m², p<0.001) and endsystolic volumes (116 ± 52 to 32 ± 11 ml/m², p<0.001) decreased and LV ejection fraction (18 ± 7 to 53 ± 12 %, p<0.0001) increased significantly after PAB. LV myocardial mass dropped significantly from 103 ± 29 to 71 ± 33 g/m² (p=0.002). LV-LS (-5.0 ± 3.4 to -8.2 ± 4.5 %, p=0.03), LV-CS (-2.8 ± 2.1 to -10.7 ± 3.5 %, p<0.001) and LV–RS (7.0 ± 6.7 to 17.8 ± 9.2 %, p<0.001) increased and intraventricular dysynchrony diminished significantly. RV size and function (EF 54 ± 12 to 55 ± 12 %, p=0.69) did not change while RV-LS (-7.0 ± 3.6 to -11.9 ± 5.5 %, p=0.01) and RV-CS (-4.2 ± 4.3 to -8.1 ± 3.3 %, p=0.02) showed significant increment.

Conclusions: In infants with left sided DCM and severely depressed function, PAB induces a rise in RV strain thereby preserving RV dimensions and function. Recovery of LV size and function is accompanied by improved intraventricular synchrony.