Myocardial deformation imaging for assessing left ventricular function in patients with transposition of great arteries after arterial switch operation

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Background: this study aims to investigate the global and regional myocardial function of the LV by 2DSTE in patients with transposition of great arteries with intact ventricular septum (TGA) after arterial switch operation (ASO).

Methods: prospective analysis of radial, circumferential and longitudinal deformation from echocardiograms in 2 groups: 58 children (5.7±4 years) after neonatal ASO and 17 healthy controls (7.6±4 years). Apical and basal short axis for 2D images were acquired (frame rate 65±7 frames/s) in addition to apical four, three and two chamber views. Global and regional peak systolic strain – longitudinal, radial and circumferential on the LV was derived and the strain curves (εLL, εCC, εRR) were extracted using a commercial software built on a 18-segment LV. A parametric paired samples T-test integrated in the statistical software SPSS was used, with p≤0.05 considered significant.

Results: Global longitudinal strain (GLS) measures of the LV were significantly different between the two groups (GLS -16.42 ± 3.08 vs. -19.29 ± 2.17, p<0.001). There was no significant differences for global circumferential (GCS) and radial strain (GRS). In the measurements of LV function, there was a clear tendency toward a decrease in the ejection fraction (63.6 ± 4.1 vs. 71.1 ± 3.2) with a concomitant increase in LV diastolic diameter (LVDD) z-score (0.7±1.0 vs. -0.3±0.8). The regional peak systolic longitudinal strain (LS) was reduced significantly, especially for segments 7 and 13 on anterior wall of LV, as well as the global longitudinal systolic strain and SR. There was no significant difference for regional circumferential (CS) and radial strain (RS).

Conclusions: reduced GLS after ASO is associated with an unfavourable trend toward reduced pump function of LV. Decreased segmental LS values are a sign of regional hypokinesia with a possible local segmental coronary ischemia during surgery and LS could be used for predictor of myocardial disturbances after ASO. Lack of significant difference for both circumferential and radial strain may be associated with still normal or slightly impaired global LV function and their changes may predict a newly onset failure of the ventricle.