

Evaluation of Right Ventricular Myocardial Deformation and Tricuspid Valve Displacement in Repaired Tetralogy of Fallot using Feature Tracking Magnetic Resonance Strain

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Introduction: The objective of this study was to investigate into correlation between right ventricular (RV) myocardial deformation and tricuspid valve (TV) displacement, and functional parameters in repaired tetralogy of Fallot (TOF) compared to normal subjects using new MR tracking program. **Hypothesis:** RV myocardial deformation and TV displacement may provide insight into RV reaction to volume overload in repaired TOF.

Methods: 50 repaired TOF patients (26.4 \pm 8.1 years) and 15 normal subjects (30.1 \pm 15.2 years) underwent a cardiovascular MRI (CMR). Developing CMR software applying a semi-automatic segmentation program of the endo and epicardium was used to perform average longitudinal and circumferential strain, strain rate (LS, LSR and CS, CSR) in mid-systole (MS) and end-diastole (ED). As well, anterior and septal TV displacement relative to the apex were measured at end-systole (ES) as the shortest distance. The displacement velocities at basal lateral and septal segment in MS and early ED were calculated.

Results: 92% of cases have evident pulmonary regurgitation with 34 \pm 18% of pulmonary regurgitant fraction (PRF). LS was reduced in repaired TOF compared to controls while CS was preserved. LS and CS decreased with increasing RV end-diastolic (EDV) and -systolic (ESV) volumes (LS & ESV $r=0.32$; CS & EDV $r=0.41$; CS & ESV $r=0.52$) and decreasing RV ejection fraction (EF) (LS & EF $r=-0.55$; CS & EF $r=-0.52$). No relationship was found between strain value and PRF. Increased anterior and septal TV displacement in ES as decreased shortening correlated positively RV volumes ($r=0.66$ and 0.63), negatively RVEF ($r=-0.44$ and -0.36) and LS ($r=0.34$ and 0.31). Decreased basal lateral displacement velocities in MS and ED as greater shortening were associated with improved LS, LSR in MS ($r=-0.57$ and -0.48) and LSR in ED ($r=-0.45$); however, there were no correlations between basal septal displacement velocity and RV functional parameters.

Conclusions: The correlations associated LS and CS with RV volumes and function without PRF suggest that preservation of CS is important in maintaining RV function. Greater lateral displacement velocity is associated with improved RV contractility.