

Volume overload impact on 3D right ventricular shape and strain: comparative analysis of tetralogy of Fallot and atrial septal defect patients

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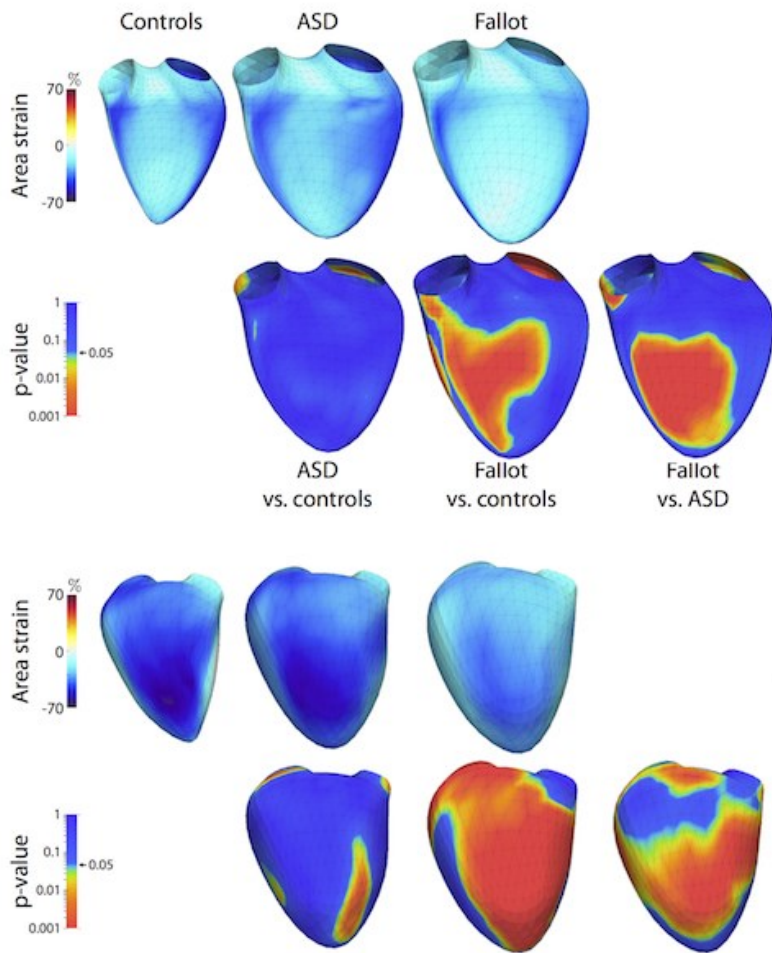
Objectives: To assess right ventricular (RV) remodeling differences between atrial septal defect (ASD), Tetralogy of Fallot (TOF) patients and controls.

Background: RV function assessment is crucial in congenital heart disease (CHD) patients, especially in ASD and TOF patients. Indeed, prognosis substantially differs between TOF and ASD patients and little is known about 3D shape and deformation in RV volume overload.

Methods: We prospectively included 55 patients (older than 16 years old) into this case-control study: 19 patients with an ASD, 15 with TOF and 21 healthy controls. 3D transthoracic RV echocardiographic sequences were acquired. Myocardial tracking was performed by a semi-automatic software. Output RV meshes including spatial correspondences were post-processed to temporally align the data and extract local deformation. Global and local statistics provided shape and deformation patterns for each subject.

Results: Curvature index highlights differences in RV shape between controls and RV volume overload patients whereas there was almost no difference between ASD and TOF patients regarding RV shape, except at the septum. No difference in RV strain was found between ASD patients and controls. There was a trend toward increased longitudinal strain in patients with small ASD whereas patients with PAH associated with ASD had lower longitudinal strain. TOF patients had lower RV area and longitudinal strain, especially in the inferior, lateral wall and in the trabecular septum. TOF patients had predominant circumferential over longitudinal strain.

Conclusion: Volume overload alters RV shape to the same extent in ASD and TOF whereas it has differential effects on strain. In ASD patients the strain is relatively preserved whereas TOF patients had particularly impaired longitudinal strain. Such detailed analyses of shape and strain could help refine RV function assessment in particular in CHD patients.



Area strain and area strain differences (p-value) between controls, ASD and TOF patients represented over the mean RV shape in each population.

Area strain differences in CHD patients