Comparison of Transthoracic Echocardiography and Cardiac Magnetic Resonance Imaging for Biventricular Function in Adult Patients After the Atrial Switch Procedure

Lynette W. Uliasz, Wei Li, Tim Homung, Lorna Swarn, Daniel J. Murphy, Jr., Michael Murken, Philip Kilgore, Matthew G. Fetterman, R. Brompton Hospital, London, United Kingdom; Stanford Medical Center, Stanford, CA

Background: Patients with transplantation of the great arteries (TGA) and previous atrial switch procedure have a systemic right ventricle (RV). RV dysfunction frequently develops and requires serial life-long assessment. Cardiac magnetic resonance imaging (CMR) is emerging as the gold standard for RV imaging, but is not widely available. We examined whether echocardiographic variables of ventricular size and function were related to analogous measurements by CMR.

Methods: Eighty-three adult patients in sinus rhythm (mean age 25.4 ± 5.1 years) have been examined using both methods. Median age at operation was 1.8 years (range 2 months - 10 years). An HP 5500 Sonos ultrasound system was used for on-line measurements in triplicate using 2D, M mode, and doppler images for RV and LV dimensions and function. CMR was performed using a 1.5 T Picker Edge or Siemens system, SSFP or turbo venous was used for analysis.

Results: Echocardiographic assessment of RV dimension (RV inlet relative to LV inlet size in the apical four chamber view) correlated strongly to CMR derived volumes (RV and diastolic volume (RVEDV) r=0.97; p<0.001, RV end systolic volume r=0.88; p=0.025) and mass (RV mass (r=0.39), p=0.008). Echocardiographic measurements of right ventricular function (aortic ejection time and velocity time integral) correlated weakly with CMR measurement of RV ejection fraction (RVEF) (r=0.5; p=0.042; n=406; p=0.053, respectively). There was an inverse relationship between dP/dt and RVEDV (r =-0.67; p=0.026). Atroventricular regurgitation at the septal leaflet by M-mode measurements correlated positively with CMR values of RV mass (r=0.31; p=0.044) and negatively with RV mass (n = 0.614; p=0.044). Echocardiographic left ventricular end diastolic dimension correlated well with CMR values of RV end diastolic volume (r=0.64; p=0.026).

Conclusion: Assessment of ventricular dimensions by echocardiography correlates well with CMR measurements in patients with previous atrial switch procedures for TGA and can be employed for serial assessment of the ventricles in this patient cohort.