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Can Simple Echocardiographic Measures Reduce the Number of Cardiac Magnetic Resonance Imaging Studies to Diagnose Right Ventricular Enlargement in Congenital Heart Disease?

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Background:
Right ventricular (RV) enlargement is used as a criterion for treatment of RV outflow tract dysfunction in patients with congenital heart disease (CHD). Although RV volumes are most accurately measured by cardiac magnetic resonance (CMR), CMR is a limited resource. Our objective was to investigate whether simple echocardiography measurements can adequately predict RV volumes below clinical thresholds, thereby reducing the need for CMR in some patients.
Methods:
Children with repaired tetralogy of Fallot (TOF), double outlet right ventricle (DORV) or truncus arteriosus (TA) who underwent CMR and echocardiography within a 4-week interval were retrospectively studied. From the 4-chamber view, indexed RV lateral wall length (RVLWLi), end-diastolic perimeter length (RVEDPi) and end-diastolic area (RVEDAi), were measured. Results were compared to CMR indexed RV volume (RVEDVi). Sensitivity and specificity of echocardiography threshold values predicting RV volumes < 170 ml/m2 were determined.
Results:
51 children (age 12.7±3.5; M:F 25:26) were reviewed. RVEDAi correlated with CMR RVEDVi (r=0.6, p<0.0001). RVEDPi and RVLWLi did not correlate with CMR. RVEDAi <20 cm2/m2 had 100% specificity to predict RVEDVi ≤ 170ml/m2 (AUC 0.79); reducing the need for CMR in 15/51 patients (29%). A threshold RVEDAi of 22 cm2/m2 would reduce CMR in 21/51 patients (41%) at the expense of 1 false negative result (figure 1). The coefficient of variation was 14.7% for intra-observer and 9.6% for inter-observer variability.
Conclusion:
Specificity of echocardiography measured RVEDAi can be set to predict RV volumes below a 170 ml/ m2 threshold in 100% of cases. This may reduce the need for CMR to determine RV volumes in ≥25% of CHD patients, potentially reducing patient burden and costs.

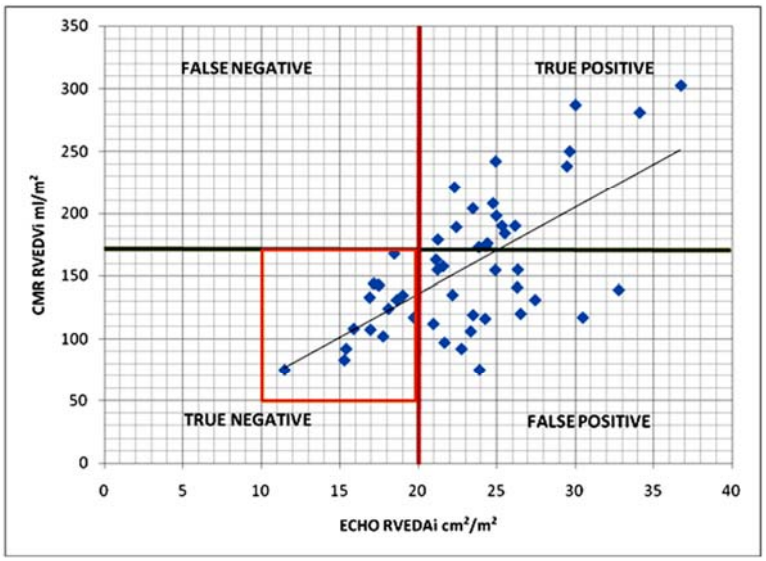

Figure 1: Correlation between echo RVEDAi and CMR RVEDVI