Improving the Role of Echocardiography in the Quantification of Right Ventricular Geometric and Functional Parameters of Corrected Tetralogy of Fallot Patients Awaiting Pulmonary Valve Replacement: Comparison with MRI Findings.

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Introduction: Right ventricular (RV) dilatation is the most frequent complications in corrected tetralogy of Fallot patients (T4F). Correct timing for pulmonary valve replacement (PVR) represents a crucial issue in the correct follow-up of these patients. However, indications for pre-PVR MRI examination in T4F patients in clinical practice is based on qualitative or only semi-quantitative echocardiographic assessment of the RV. The aim of our study was to report the diagnostic accuracy of echocardiography in the definition of RV geometry and function and to develop a model to improve the correct identification of T4F patients undergoing pre-PVR MRI study.

Methods: We studied 174 corrected T4F patients, who performed an echocardiographic examination and an MRI study in order to establish indications for PVR. Indications for PVR were defined as RV end diastolic volume index $\geq 155$ ml/m² and/or RV EF < 47%.

Results: 95 patients had echocardiographic exams with adequate quality to derive parameters for the present analysis study. Of the 95 patients ultimately included in the analysis, 41% met MRI criteria for PVR. When analyzing functional parameters we found a strong association between MRI-EF and ECHO-RVFAC ($r=0.42; p<0.001$), with no association identified with other routine echocardiographic parameters of RV function. When analyzing geometric parameters a significant association between all echocardiographic parameters (RV area, RV length and diameters, proximal and distal RVOT diameters) and MRI-RV end diastolic volume could be observed (all $p<0.05$), with the strongest association found for RV diastolic area ($r=0.66; p<0.001$), and proximal RVOT diameter ($r=0.55; p<0.001$). Thus, we defined a regression equation for predicting MRI volume using echocardiography ($RV$ EDV [MRI] = [Coeff.A * $RVED$ area] + [Coeff.B * RVOTprox] $- K$; $r^2=0.59; p<0.001$; model tolerance $>0.75$). Applying regression equation we were able to correctly identify 64% patients according to PVR criteria, significantly improving the diagnostic ability of echocardiography in these patients.

Conclusions: Echocardiographic assessment of the RV in T4F is limited by exam quality. However, when available, combining parameters assessing the RV inflow and outflow in a simple regression equation, allows an accurate estimate of MRI-RV volume, thus improving the echocardiographic ability to correctly identify T4F patients candidate for pre-PVR MRI study.