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Multiparametric assessment of the Right Ventricle by echocardiography in adult patients with repaired tetralogy of Fallot undergoing pulmonary valve replacement: a comparative study with MRI.

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Purpose: Evaluation of the right ventricle (RV) using transthoracic echocardiography is challenging in patients with congenital heart disease affecting the right ventricular outflow tract such as Tetralogy of Fallot (TOF). MRI is commonly used to determine the best timing for pulmonary valve replacement (PVR) but accessibility remains limited. The objective of this study was to evaluate the feasibility and the accuracy of a multiparametric echographic approach including 2D strain and 3D for RV volumes and function assessment, in comparison with MRI.

Methods and results: we performed a complete echocardiographic study including 2D parameters (TAPSE, S' TDI, Tei indice, index Fractional Area Change (FAC)), 2D strain and 3D and unsedated cardiac MRI in 26 consecutive patients with repaired TOF before pulmonary valve replacement and one year after surgery. Correlation between echography and MRI RVEF was poor for TAPSE, S' TDI and 2D strain but good for FAC ($r=0.70$, $p<0.01$ and $r=0.68$, $p<0.01$, before and after PVR respectively) and 3D assessment ($r=0.96$, $p<0.01$ and $r=0.98$, $p<0.01$ before and after PVR respectively). Despite RV volume underestimation by 3D echography, correlation for RV volume assessment between 3D analysis and MRI was excellent in both pre and post-operative assessment ($r=0.88$, $p<0.01$ and $r=0.91$, $p<0.01$ respectively for RV end-diastolic volume; $r=0.92$, $p<0.01$ and $r=0.95$, $p<0.01$ respectively for RV end-systolic volume).

Conclusion: Global approach of RV function using 2D (FAC) or (3D) parameters seems reliable in patients with repaired TOF. The commonly used TAPSE and S'TDI focused on segmental analysis of RV inflow are less sensitive probably because RV inflow is less affected by RV remodelling related to initial surgical repair.