Functional analysis of the anatomical right ventricular components: should assessment of right ventricular function after repair of tetralogy of Fallot be refined?

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Objective: Follow-up after ToF correction is directed to detect timely RV dysfunction by following the pulmonary regurgitation and global RV function and size, with little attention for the effective contribution of regional RV dysfunction. This study aims to determine the contribution of regional RV dysfunction on functional capacity after repair of ToF.

Methods: 42 ToF patients were investigated with CMRI for regional RV dysfunction in relation to global RV function by functional quantification of sinus and outflow part of the RV. Impact of regional and global RV dysfunction on clinical status was studied by exercise testing.

Results: Global RV function was lower than RVsinus function (EF 52 ± 12 % versus 57 ± 10 %, p<0.001), attributable to the adverse influence of RVOT dysfunction (EF 34 ± 17 %). Percent predicted peak VO2 correlated better with RVsinus EF compared to global RVEF (r=0.51, p=0.001 versus r=0.44, p=0.004). Multivariate analysis revealed RVsinus EF (β = 0.34, 95%CI 0.07-0.61, p=0.013) and extent of RVOT akinesia (β = -0.28, 95%CI -0.50; -0.06, p=0.015) as significant determinants of exercise capacity. Impaired exercise performance, defined as % predicted peak VO2 < 85%, occurred in 43% of the patients and was independently determined by type of repair (transventricular versus transatrial: OR. 6.0, 95%CI 1.31-17.3, p=0.02) due to greater sinus and RVOT dysfunction.

Conclusion: Functional analysis of the RV components shows that exercise capacity after ToF repair is better predicted by systolic function of the RVsinus as the extent of RVOT dysfunction commonly leads to underestimation of global RV function. Further validation in larger scale studies is needed to postulate whether this method of RV analysis is more appropriate than assessment of global RV volumes for timely detection of early RV dysfunction in order to initiate subsequent pulmonary valve implantation with eventual associated surgical RVOT remodeling.