The role of cardiac magnetic resonance to address the treatment of choice for pulmonary valve replacement late after repair of Tetralogy of Fallot

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Introduction: Severe pulmonary regurgitation (PR) with progressive right ventricular (RV) dilatation and dysfunction occurs late after repair of Tetralogy of Fallot (TOF) and may be strongly associated with ventricular tachycardia and sudden death. Cardiac magnetic resonance (CMR) is the gold standard to evaluate the pathophysiology in repaired TOF and the main tool to support decision for pulmonary valve replacement (PVR) in asymptomatic patients. Given the various options available for PVR, we sought to evaluate the usefulness of CRM to address patients towards either a surgical or interventional procedure.

Methods: Between 2008 and 2012, 69 patients with repaired TOF underwent CMR study to address PVR. Indications for PVR were RV end-diastolic volume > 150 ml/m², RV end-systolic volume index > 80 ml/m² and a RV ejection fraction < 47%. Pulmonary trunk (PT) morphology, length, and dimensions measured at three levels (PV remnant, mid-portion, bifurcation) and coronary anatomy were evaluated, using a 3D SSFP navigator sequence. PT expansion during the cardiac cycle was assessed by cine sequences in three planes.

Results: Right ventricular outflow tract (RVOT) and coronary examination was possible in all patients. Suitability for percutaneous treatment included maximum PT diameter between 19 and 27 mm and PT length greater than 20 mm, whereas RVOT aneurisms, shape irregularity and/or significant systolic PT expansion were exclusion criteria. Associated pulmonary branch stenosis and/or hypoplasia were indication for homograft RVOT replacement. Seven patients (10%) were addressed to transcatheter PV, which was successful in all cases. All other patients (90%) underwent surgery by means of bioprosthetic (37), homograft (17), perventricular injectable valve (8). There were no deaths or major complications.

Conclusions: CMR is a fundamental tool after TOF repair, not only in assessing RV volumes and function, but also in evaluating RV outflow tract measures and morphology during the cardiac cycle in order to address the best choice for PVR.