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4D flow magnetic resonance postoperative pulmonary stenosis assessment in patients with transposition of the great arteries repaired by arterial switch

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Background

Right ventricular outflow tract obstruction (RVOTO) is a common complication in adult patients who had arterial switch (ASO) for transposition of the great arteries (TGA). Reoperation for RVOTO is recommended in symptomatic patients with right ventricular systolic pressure greater than 60 mmHg (velocity of tricuspid regurgitation (IT) > 3.5 m / sec). However, pulmonary flow measurement with transthoracic echocardiography Doppler (TTE) is hardly reliable.

4D flow in magnetic resonance is a new imaging method, allowing analysis of blood velocity and flow in an entire volume, permitting detection, quantification and location of vascular stenosis.

Objective: to compare this 4D flow imaging to TTE for the diagnosis of pulmonary stenosis in adult patients after ASO for TGA.

Methods and results

33 patients (19 men, 14 women, mean age 25.5 years old) were prospectively included with a TTE and a MRI 4D flow examination on the same day.

In 16 patients (48.5%), RVOTO was not correctly evaluated by TTE vs. in 0 (0%) with 4D flow. TTE detected 11 (33.3%) patients with mild RVOTO (max; velocity 2m/s) and 2 (6%) patients with moderate RVOTO (max; velocity 3.5m/s) vs. 14 (42%) and 4 (12.1%) respectively with 4D flow. The peak flow velocities measurements in Doppler and 4D flow were highly correlated ($r=0.79$; $p < 0.0001$). In addition, peak velocity and the right ventricle mass index correlated in 4D flow better than with TTE ($r=0.74$; $p < 0.001$ vs. $r=0.55$; $p=0.02$)

4D flow was also more precise to locate the site of RVOTO on the distal pulmonary trunk in 19 patients and on the pulmonary artery branches in 14 patients.

Conclusion

4D flow MRI is a reliable tool for assessment of RVOTO after the ASO for TGA in adult patients and should potentially be part of routine evaluation in the monitoring of these patients.