Cardiopulmonary exercise test (CPET) and dobutamine stress cardiac magnetic resonance imaging (CMR) in young adults after neonatal arterial switch operation (ASO) in transposition of the great arteries (TGA)

Department of Paediatric Cardiology, University Hospital Aachen, Germany (1); Department of Cardiology, University Hospital Aachen, Germany (2)

Objectives:
Monocentric prospective study to evaluate objective exercise capacity, rate and extent of stress induced myocardial ischemia and abnormal pulmonary blood flow distribution (PBFD) at rest and under dobutamine stress.

Methods:
49 unselected patients (age 18-28 y) underwent CPET (bicycle) and CMR (1.5 Tesla) at rest (coronary scan, cine, phase contrast flow) and under dobutamine (DSMR; cine, phase contrast flow), followed by angiography and late gadolinium enhancement (LGE).

Results:
CPET:
All patients reached maximal exercise effort (HRmax 174.0 ± 17.3/min). Peak oxygen uptake (% of predicted peak VO2) (Wasserman): 85.8 ± 10.4 % (borderline normal); norm percentile (Dubowy, 2008): 13.2 ± 12.2 (z-value = -1). Ventilatory efficiency VE/VCO2 at anaerobic threshold: 26.9 ± 2.6 (normal 23 - 30).

CMR:
Coronary arteries: 1x known prox. LAD occlusion (collateralized via RCA; coronary type AB1), 1x proximal LCA-occlusion, LIMA-bypass). No other stenosis or kinking of the proximal coronary arteries. Coronary classification (Sauer): 38x A1 (normal type), 5x AB1 (RCX originates from RCA), 6x B1 (right single ostium, LCA retroaortal). 3 patients reclassified compared to operation report.
Ventricular function: LV: no regional wall motion abnormalities; 5x EF < 55% (43%-54%). 1x non compaction cardiomyopathy. RV: all EF > 48%. 1x RVOT-aneurysm.
Neo-aortic regurgitation : 2x moderate (reg. fraction 16% and 19 %).
DSMR: 47/49 reached target heart rate; 1x termination at 120/min due to complex ventricular ectopic beats, 1x termination at 160/min due to trigger problems. 1 patient with known LAD occlusion had strong chest pain and hypokinesia in 1 segment under maximum stress.
PBFD at rest: 6/49 patients had prior intervention for RVOT/PA-stenosis. 6/49 abnormal PBFD (>2:1). 4/49 relevant stenosis of the mean PA (>2.5 m/s); -> cumulative rate of relevant RVOT/PA stenosis or abnormal PBFD:12/49 (25%).
PBFD under DSMR: no worsening compared to PBFD at rest. On individual patient level, no worsening of abnormal PBFD.
LGE: no myocardial scar. 1/49 intramyocardial fibrosis.

Conclusion:
CPET functional status was borderline normal. CMR found no new proximal coronary stenosis or kinking. 2/49 DSMR were pathologic. 12/49 patients (25 %) had relevant RVOT/PA stenosis (6 new, 6 prior known). PBFD did not worsen under dobutamine stress.