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First Pass Perfusion Reserve Index in Paediatric Patients with Arterial Switch for Transposition of Great Arteries

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Background : Arterial switch operation is the treatment of choice for correction of transposition of the great arteries (TGA). Coronary anatomy is the most impacting early prognostic factor after surgery. We previously described potential mechanisms of late coronary complications. Data about late coronary outcome are lacking. Noninvasive first pass perfusion with cardiac magnetic resonance (cMRI) is sensitive technique for evaluation of myocardial perfusion in ischemic heart disease. We aimed to apply a comprehensive cMRI protocol to assess coronary artery complications in late follow up after this surgery .

Methods: Between 2010 and 2015, 66 patients were prospectively enrolled (median age 13.9 ± 5.5 years) into two groups according to the presence (9/66) or absence (57/66) of coronary arteries abnormalities at previous screening test at 5 ± 2 years. Coronary position and anatomy were analysed as previously described. Semi-quantitative evaluation of myocardial perfusion was performed by the analysis of myocardial First-Pass perfusion images at rest and during adenosine infusion and the segmental perfusion reserve index (PRI) was calculated. Late gadolinium enhancement (LGE) was studied.

Results: Eleven patients (11/66= 16%) had perfusion defects ($PRI < 1.5$). In 9/11 perfusion defects were in anterior-anteroseptal or anterolateral segments vs 2/11 in inferior-inferoseptal-inferolateral segments. In 16 (16/66 = 24%) patients left coronary artery was reimplanted in clock position 11 or 12. These patients had more frequent perfusion defects than other patients (7 vs 2, $p=0.004$). Moreover, considering only the myocardial segments irrigated by left coronary artery, semiquantitative perfusion defects were found only in patients with left coronary artery in position 11 and 12 (7 vs 0, $p=0.0002$). These patients had significantly lower PRI in myocardial segments irrigated by left coronary artery myocardial than other patients (2.0 ± 1 vs 2.7 ± 1 , $p < 0.05$). LGE was positive in 2 cases. No patients with decreased PRI had LGE. All patients with decreased PRI were asymptomatic and did not show echocardiographic or functional signs of myocardial ischemia.

Conclusion: cMRI can provide a useful tool for detecting asymptomatic myocardial perfusion delay. PRI analysis results confirm the presence of a high-risk group of patients. Clinical implication of early detection of perfusion delay should be investigated.