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Cardiopulmonary exercise test among children with congenital heart diseases : a multicenter study

*Amedro P. (1,4), Gavotto A. (1,5), Guillaumont S. (1,2), Picot M.C. (3), Matecki S. (4,5)
Pediatric and Congenital Cardiology Department, University Hospital, Montpellier, France (1);
Pediatric Cardiology and Rehabilitation Unit, Saint-Pierre Institute, Palavas-Les-Flots, France (2);
Epidemiology and Clinical Research Department, University Hospital, Montpellier, France (3);
Physiology and Experimental Biology of Heart and Muscles Laboratory - PHYMEDEXP, UMR CNRS
9214 – INSERM U1046, University of Montpellier, Montpellier, France (4); Pediatric Functional
Exploration Laboratory, Physiology Department, University Hospital, Montpellier, France (5)*

Introduction: Cardiopulmonary exercise test (CPET) is recommended in the follow-up of adults with congenital heart diseases (CHD). In children few centers have the expertise of this test. However, we recently showed that maximum oxygen uptake (VO₂max) is correlated to health-related quality of life in children with CHD.

Purpose: We aimed to perform CPET among a large cohort of CHD children and to compare their VO₂max to that of a control population. We also intended to identify variables that most impacted VO₂max in this population.

Methods: We included all children aged less than 18 who performed a complete CPET between 2010 and 2015 in 2 French pediatric CHD tertiary care centers. CHD group was defined upon Houyel's classification. Children with no chronic disease, no treatment and normal physical examination were included in the control group. Data were adjusted on age and gender. The impact of CPET and clinical variables on VO₂max was studied with multivariate analysis.

Results: 798 children (496 CHD and 302 controls) were included in the study. VO₂max was significantly lower in the CHD group, overall and for each sub-group (p<0.05). However, mean VO₂max in the CHD group was good (93% of predicted value). Children with single ventricles had the lowest value (72%). VO₂max significantly decreased with age in the CHD group. VO₂max was impacted by left ventricle ejection fraction, right ventricle systolic pressure, left outflow tract obstacle or regurgitation, right outflow tract regurgitation and abnormal pulmonary function test. VE/VCO₂ slope was more elevated in right heart diseases. Anaerobic threshold, oxygen uptake efficiency slope (OUES) and oxygen pulse correlated well to VO₂max.

Conclusion: VO₂max among children with CHD is not as altered as in adults but remained significantly lower than normal children. We recommend performing CPET in routine follow-up of these patients. We should now focus on pediatric cardiac rehabilitation among CHD children.