Evaluation of exercise capacity with cardiopulmonary exercise testing in adult patients with Fontan circulation

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Introduction: Reduction of functional capacity in patients that underwent Fontan´s surgery is well known. Exercise intolerance in this group is directly related to increased morbimortality. In congenital heart disease patients a peak value of oxygen consumption (VO2) <15 mL / kg / min or <50% of the predicted VO2 has been recommended as a cut-off value for cardiac transplantation according to current ACC / AHA Guidelines.

Aims: To evaluate Fontan´s patients’ functional capacity using the cardiopulmonary exercise-test (CPET).

Methods / Results: Eleven patients (45% male, mean age 29 ± 5.9 years) that underwent CPET between 2010 and 2014 in a tertiary center dedicated to the follow-up of Adult Congenital Heart disease were included in our analysis Statistical analysis was performed using R 3.1.0 software. Results were considered statistically significant if p<0.05.

The most common type of surgery carried out was the cavo-pulmonary technique with an intracardiac conduit (55% patients). In the remaining, a classical Fontan operation or one of its variants was performed. The mean age at surgery was 8 ± 4.1 years. Two thirds of the population had Tricuspid Atresia (TA) with transposition of great vessels and one third, isolated TA or associated with pulmonary stenosis.

About 80% of the patients reported limitations to their physical activity, six were in NYHA class II and three were in NYHA Class III. The CPET in this population showed an average VO2 of 20 ml/kg/min, with half of the patients in Class B Weber. Although approximately half of the patients (n = 5) were in Ventilatory Class I, 35% had a minute ventilation/carbon dioxide production (VE/VCO2 slope) between 36 and 43 (ventilatory class III). The latter patients had a significantly higher incidence of thromboembolic events and arrhythmias. Heart rate (HR) reserve, was higher in patients who had undergone Fontan surgery at a younger age (p <0.05; R2 = 0.4).

Conclusions: The majority of patients had a moderate reduction in functional capacity. Patients with severe intolerance to exercise had a higher risk of major cardiac events. The completion of the Fontan surgery at a younger age is associated with higher HR reserve.