

Exercise Capacity in Children and Young Adults after Repair of Congenital Heart Disease

Uriel Katz^{1,2}, Ronen Reuveny¹, Omer Rosenblum², Avshalom Koren³, Gal Dubnov-Raz^{2,4}

¹*Edmond J. Safra International Congenital Heart Center, The Edmond and Lily Safra Children's Hospital, Sheba Medical Center, Israel*

²*Sackler Faculty of Medicine, Tel Aviv University, Israel*

³*Statistics, The Academic College of Tel Aviv-Yaffo, Israel*

⁴*Lifestyle, Exercise and Nutrition Clinic, The Edmond and Lily Safra Children's Hospital, Sheba Medical Center, Israel*

Introduction:

The availability of corrective interventions for congenital heart disease (CHD) resulted in an increasing number of individuals with repaired congenital lesions.

Cardiopulmonary exercise testing (CPET) enables evaluation of cardiac function at maximal capacity, and provides important information on functional status and outcome.

We determined maximal exercise capacity in a group of CHD patients after corrective interventions, compared with normal controls.

Methods:

The study population included CHD patients younger than 40 years of age and with no significant comorbidities, that had undergone biventricular corrective interventions (catheterization/surgery) (n=73), referred to our laboratory for CPET.

Measures of fitness, cardiac and pulmonary functions were compared between CHD and control (n=79) groups using multiple linear regression techniques and analysis of covariance, after adjustment for age and sex. Similar comparisons were also made between CHD patients with complete vs. sub-total repair (determined by significant anatomical residua on a resting echocardiogram).

Results:

CHD patients had a significantly lower aerobic fitness compared with controls ($VO_2\text{max}$ 29 ± 8 vs. 38 ± 10 ml/kg/min, $p=0.001$); only 19% had normal fitness ($VO_2\text{max}>85\%$ predicted), compared with 62% of controls ($p<0.001$).

Peak oxygen pulse, which is related to forward stroke volume at peak exercise, was normal in only 47% of CHD patients, compared with 76% of controls ($p<0.001$).

A significantly higher VE/VCO_2 slope, which best represents abnormal cardiac function, was seen in CHD patients compared with controls (28 ± 5 vs. 26 ± 3 , $p=0.019$).

None of the measured cardio-respiratory parameters differed between CHD subgroups.

There were no remarkable adverse events during the CPETs.

Conclusion:

Patients after biventricular CHD repair have a significantly decreased exercise capacity, mostly due to the combination of abnormal cardiac function combined and deconditioning. The measured cardiac parameters were low even in patients with good surgical outcomes, as evident by echocardiography, indicating the latter's limited ability in assessing long-term maximal cardiac capacity.