

Analysis of exercise capacity, quality of life and leisure sports in patients with a Fontan circulation

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Background/Introduction: Despite the improvement in survival, patients with a Fontan circulation are exposed to numerous complications as well as a reduced exercise capacity and quality of life.

Purpose: To assess the influence of the type of single ventricle (right vs. left) and the amount of sporting activity on exercise capacity and health related quality of life (HRQoL) in a large group of Fontan patients.

Methods: Retrospective analysis of standardised cardiopulmonary exercise tests (CPET) performed on a treadmill between 2014 and 2019. Questionnaires to measure HRQoL and sporting activity were sent to study participants.

Results: 79 patients were enrolled in this study (female, n = 31). 56 of them had a systemic right ventricle (SRV), 20 had a systemic left ventricle (SLV) and 3 had diverse anatomies. Median age at CPET was 12.2 years (range 6.2-34.4 years). The results for important exercise parameters were as follows: peak oxygen uptake (VO₂max) 30.7 ± 6.2 ml/kg/min, oxygen uptake at anaerobic threshold (VO₂-VAT) 24.7 ± 5.8 ml/kg/min, peak oxygen pulse 8.2 ± 3.4 mlO₂/beat and VE/VCO₂ slope 39.8 ± 9.1. There was no significant difference in VO₂max, VO₂-VAT, peak oxygen pulse and VE/CO₂ slope between SRV and SLV patients: VO₂max 30.2 ± 5.6 vs. 32.8 ± 7.5 ml/kg/min, p = 0.14; VO₂-AT 24.4 ± 5.3 vs. 25.7 ± 7.3 ml/kg/min, p = 0.53; peak oxygen pulse 7.8 ± 3.2 vs. 9.5 ± 3.9 mlO₂/beat, p = 0.06; VE/CO₂ slope 41.1 ± 9.6 vs. 36.9 ± 6.8, p = 0.10. Analyses of the questionnaires revealed that most of the patients do leisure sports (n = 60, 76%) with nearly half of them more than two hours per week (n = 26, 33%).

In a subgroup analysis of patients under 18 years (n = 51, 65%) we found that nearly all of them participate in school sports (n = 50) and have a good subjective healthiness (n = 47). VO₂-VAT and VO₂max correlated positively with subjective healthiness (VO₂-VAT r = 0.32, p < 0.05; VO₂max r = 0.35, p < 0.05) as well as with the amount of leisure sports activity (hours/week) (VO₂-VAT r = 0.37, p < 0.01; VO₂max r = 0.50, p < 0.01).

Conclusions: By analysing a large group of patients in Fontan circulation we could demonstrate that there is no difference in exercise capacity between SRV and SLV patients. Furthermore, most of the patients participate in leisure sports and have a good subjective healthiness. In a subgroup of paediatric patients, we were able to show that a better exercise capacity is associated with increased leisure sports activity and a better subjective healthiness.