

CPET in children with congenital heart disease: comparison between postoperated Tetralogy of Fallot and Fontan procedure

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INTRODUCTION: Postoperated children with complex congenital heart disease (CHD) have a decreased functional capacity (FxC) associated with death and hospitalization. Cardio pulmonary exercise test (CPET) assesses their FxC and shows specific patterns according to different physiological adaptations depending on the type of CHD.

OBJECTIVE: The aim of this investigation was to define and compare the exercise performance of postoperated Tetralogy of Fallot children (PTF) against subjects that had undergone a Fontan procedure (FP) through CPET.

METHODS: Retrospective observational study of 25 PTF (mean age 12 ± 3.2 years, weight 43.2 ± 14.55 kg, height 146.7 ± 14.4 cm, 58% male) and 63 Fontan (mean age 11.8 ± 3.4 years, weight 41.9 ± 17 kg, height 146.5 ± 17.5 cm, 56% male). Inclusion criteria admitted pulmonary atresia with VSD in the PTF group and both right or left systemic ventricles in the FT group. Patients with pacemakers, sinus node dysfunction or junctional rhythm were excluded. Ramp treadmill ergometry (Bruce protocol) was performed with expired gas in all cases. **RESULTS:** Submaximal exercise tests limited by symptoms were performed, clinically and electrically negative in all cases, with no significant arrhythmias. 38% of FP reached 85% MPPHR vs 32% in PTF. From the FP, 62% showed a normal spirometric pattern and 28.6% restrictive vs 56% with normal pattern and 20% restrictive in PTF group. CPET results were:

	FONTAN procedure N=63	Postoperated T. of FALLOT N=25
Effort time (min)	10.22 ± 2.4	10.3 ± 2.7
METs	8.8 ± 2.4	9.3 ± 3
Resting HR (bpm)	95 ± 17	89 ± 13.8
Max HR	164 ± 26	169.7 ± 17.3
HRR	69 ± 27	80.7 ± 22.3
Max predicted HR (%)	77 ± 13.5	79.6 ± 9.3
Resting SBP/DBP (mmHg)	102 ± 14 / 59 ± 9	97.4 ± 10 / 56.6 ± 8.4
Max SBP/DBP (mmHg)	127 ± 19 / 69.5 ± 9	125.4 ± 10.3 / 71.2 ± 7.5
Double product	20950 ± 3372.2	20938 ± 2817
Max VO ₂ (%)	76 ± 19.8	79.5 ± 10.2
O ₂ pulse (%)	102.16 ± 33	101 ± 18.5
VE/VCO ₂ slope (°)	38 ± 6.8	33.4 ± 8.3
O ₂ equivalents	36.9 ± 6.2	32.7 ± 7.3
CO ₂ equivalents	39.3 ± 7.5	34.9 ± 6.8
Breathing Reserve	39 ± 12.3	42 ± 14.6
OUES	1.47 ± 0.55	1.57 ± 0.51

We found no significant differences between groups.

From a cardiovascular standpoint VO₂ was decreased in both groups, revealing impaired ExC. with normal O₂ pulse (appropriate stroke volume).

FP group showed ventilatory inefficiency with higher V slope and CO₂ equivalents (V/Q disturbance), whilst in the PTF group those parameters were limit.

CONCLUSIONS

Functional capacity is decreased in both PTF and FP patients. Ventilatory efficiency variables revealed V/Q imbalance between FP subjects (according to their condition). This disturbance is only appreciated in PF when significant RV dysfunction develops.