

Positive trajectory of exercise capacity during childhood predicts better adult Fontan physiology

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Introduction: Exercise training is recommended for favorable effects on Fontan pathophysiology. However, long-term benefits of exercise training remain unclear.

Objective: This study was to elucidate an impact of trajectory of exercise capacity during childhood, which mimics effect of exercise training, on the adult Fontan pathophysiology.

Method and Results: Since 1990, consecutive 131 Fontan patients had undergone two serial cardiopulmonary exercise testing (CPX1 and CPX2) during childhood (ages of 8 ± 2 and 14 ± 2) and in their adulthood (CPX3, 23 ± 5 years). The change in peak oxygen uptake (PVO2: % of normal) from CPX1 to CPX2 (PdPVO2) and from CPX2 to CPX3 (AdPVO2) were calculated, then our patients were divided into 4 subgroups according to the dPVO2: groups of II (PdPVO2 \geq 0%+AdPVO2 \geq 0%, n=51), ID (PdPVO2 \geq 0%+AdPVO2<0%, n=46), DI (PdPVO2<0%+AdPVO2 \geq 0%, n=18), and DD (PdPVO2<0%+AdPVO2<0%, n=16). When compared with groups of DI and DD, adulthood plasma brain natriuretic peptide levels and renal resistive index were lower and plasma levels of albumin, cholinesterase and PVO2 were higher in the groups of II and ID ($p<0.05$ to 0.0001). In addition, adulthood body non fat percentage was higher in the groups of II and ID ($p<0.05$). After CPX3, 20 unexpected clinical events, including 5 deaths, occurred. Risk of the events was 72% lower in the groups of II and ID than in the groups of DI and DD ($p<0.01$). In particular, the risk reduction was 88% in the group of II when compared with that in group DD ($p<0.001$).

Conclusions: Positive trajectory of exercise capacity in childhood predicts better adult Fontan pathophysiology, including better prognosis. Thus, prescription of exercise should be a part of postoperative management strategy in pediatric Fontan patients.