MP2-6

Impaired lung function in children and adolescents with Fontan circulation may improve after endurance training

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Objectives: To study lung function and physical capacity in children and adolescents after Fontan palliation compared with matched healthy controls. We also studied the effect of endurance training on lung function.

Methods: Fontan patients (n = 30) and healthy age- and gender-matched control subjects (n = 25) performed dynamic and static spirometry, pulmonary diffusing capacity and maximal oxygen uptake before and after a 12-week endurance training program and at follow-up after one year.

Results: Fontan patients have a restrictive lung pattern, a reduced pulmonary diffusing capacity (4.27 ± 1.16 mmol·kPa-1·min-1 vs. 6.61 ± 1.88 mmol·kPa-1·min-1, $p < 0.001$) and a reduced maximal oxygen uptake (35.0 ± 5.1 ml·min-1·kg-1 vs. 43.7 ± 8.4 ml·min-1·kg-1, $p < 0.001$) when compared to controls. Patients had signs of air trapping with a higher portion of residual volume of total lung capacity than controls (26 ± 6 % vs. 22 ± 5 %, $p < 0.05$). Vital capacity increased for patients (from 2.80 ± 0.97 liters to 2.91 ± 0.95 liters, $p < 0.05$) but not for controls after an endurance training program.

Conclusions: Fontan patients have a restrictive lung pattern, reduced pulmonary diffusing capacity and a reduced maximal oxygen uptake when compared to healthy controls. Fontan patients may also have air trapping. Endurance training seems to improve vital capacity in this patient group, possibly because of an improvement of chest musculature and movement. Lung function and exercise tests provide important information when managing this patient group. Apart from general beneficiary effects, exercise may improve lung function in young Fontan patients and should be encouraged.