

Hypobaric hypoxia during air travel in patients after the Fontan operation

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Introduction: Pulmonary circulation has unique characteristics in patients after the Fontan operation, which includes lack of pulmonary ventricle, non-pulsatile flow, leading to mild hypoxia mainly due to ventilation/perfusion mismatch in the lung. Although Fontan patients have increasing opportunity of air travel, there has been no evidence-based recommendation for air travel because of no available data on an effect of hypobaric hypoxia (HH) during air travel in these patients.

Methods: We prospectively checked changes in percutaneous oxygen saturation (SpO₂;%) and heart rate (HR;bpm) (PULSOX-Me300) during commercial air travel in 7 clinically stable Fontan patients (male = 3, aged 15 to 33 years with the postoperative follow-up of 14-23 years). These patients were asked to list a departure point, an arrival point, and any major adverse event(s) or symptoms during air travel, including headache and palpitations. We compared the dynamics of SpO₂ and HR during air travel with recent hemodynamics, pulmonary function test and cardiopulmonary variables during exercise testing (CPX).

Results: Decrease in SpO₂ from baseline (92.4±3.7%) to 1st stabilized HH (87.9±5.3%) during air travel was 4.5±2.3% (0.8-7.3%) and was correlated with decrease in SpO₂ during CPX (p = 0.0499). SpO₂ at 1st stabilized HH correlate with the lowest SpO₂ at CPX (70-94%) (p = 0.0192). The peak VO₂ was correlated with the lower SpO₂ at 1st stabilized HH (r = 0.9132, p = 0.0041). Any hemodynamic data during catheterization did not predict the SpO₂ dynamics during corresponding flight. The flight duration was inversely correlated with the magnitude of HH (r = -0.9613, p = 0.0387). One patient with the lowest SpO₂ of 78% at 1st stabilized HH experienced headache and malaise during his flight.

Conclusions: Fontan patients showed significant HH during air travel with a wide individual variety. Exercise-induced hypoxia strongly predicted the hypobaric-induced hypoxia and CPX with SpO₂ monitoring may help clinicians to guide the air travel in these patients.