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Format: Abstract

Hyperoxia Reduces Oxygen Consumption in Children with Pulmonary Hypertension.

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Abstract

High inspired oxygen concentration ($FiO_2 > 0.85$) is administered to test pulmonary vascular reactivity in children with pulmonary hypertension (PH). It is difficult to measure oxygen consumption (VO_2) if the subject is breathing a hyperoxic gas mixture so the assumption is made that baseline VO_2 does not change. We hypothesized that hyperoxia changes VO_2. We sought to compare the VO_2 measured by a thermodilution catheter in room air and hyperoxia. A retrospective review of the hemodynamic data obtained in children with PH who underwent cardiac catheterization was conducted between 2009 and 2014. Cardiac index (CI) was measured by a thermodilution catheter in room air and hyperoxia. VO_2 was calculated using the equation CI = VO_2/arterial-venous oxygen content difference. Data were available in 24 subjects (males = 10), with median age 8.3 years (0.8-17.6 years), weight 23.3 kg (7.5-95 kg), and body surface area 0.9 m^2 (0.4-2.0 m^2). In hyperoxia compared with room air, we measured decreased VO_2 (154 ± 38 to 136 ± 34 ml/min/m^2, p = 0.007), heart rate (91 [Formula: see text] 20 to 83 [Formula: see text] 21 beats/minute, p=0.005), mean pulmonary artery pressure (41 [Formula: see text] 16 to 35 [Formula: see text] 14 mmHg, p=0.024), CI (3.6 [Formula: see text] 0.8 to 3.3 [Formula: see text] 0.9 L/min/m^2, p = 0.03), pulmonary vascular resistance (9 [Formula: see text] 6 to 7 [Formula: see text] 3 WU m^2, p = 0.029), increased mean aortic (61 [Formula: see text] 11 to 67 [Formula: see text] 11 mmHg, p = 0.005), pulmonary artery wedge pressures (11 [Formula: see text] 8 to 13 [Formula: see text] 9 mmHg, p = 0.006), and systemic vascular resistance (12 [Formula: see text] 6 to 20 [Formula: see text] 7 WU m^2, p=0.001). Hyperoxia decreased VO_2 and CI and caused pulmonary vasodilation and systemic vasoconstriction in children with PH. The assumption that VO_2 remains unchanged in hyperoxia may be incorrect and, if the Fick equation is used, may lead to an overestimation of pulmonary blood flow and underestimation of PVRI.