
ARTICLES

The preflight evaluation. A comparison of the hypoxia inhalation test with hypobaric exposure

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STUDY OBJECTIVES: We sought to compare arterial oxygen partial pressure (PaO₂) relationships between a 15.1% hypoxia inhalation test (HIT) at sea level and a hypobaric chamber exposure equivalent to 2,438 m (8,000 feet) of altitude above sea level in patients with chronic obstructive pulmonary disease (COPD) and healthy subjects. **DESIGN:** Comparison of physiologic variables before and during intervention. **SETTING:** A referral-based pulmonary disease clinic at a US Army medical center in a metropolitan area. **SUBJECTS:** The study included three groups: group 1, 15 patients, 3 women and 12 men, with COPD (forced expiratory volume in the first second [FEV₁, mean +/- SD], 41 +/- 14% of predicted); group 2, 9 healthy men; and group 3, 18 men with COPD (FEV₁, 31 +/- 10% of predicted) previously reported in detail. **INTERVENTIONS:** We evaluated each group at sea level followed by one of two different types of hypoxic exposures. Group 1 received exposure to 15.1% oxygen at sea level, the HIT. Groups 2 and 3 received hypobaric chamber exposure equivalent to 2,438 m (8,000 feet) above sea level. **MEASUREMENTS AND MAIN RESULTS:** For all three groups combined, the arterial oxygen tension at sea level (PaO₂SL) explained significant variability in PaO₂ during hypoxic exposure according to the following formula: PaO₂ during exposure = 0.417 (PaO₂SL) + 17.802 (n = 42; r = 0.756; p < 0.001). Neither the type of hypoxic exposure (HIT vs hypobaric), status as patient vs control, sex, nor age explained significant variability in PaO₂ during hypoxia exposure after inclusion of PaO₂SL as a covariate in analysis of variance. Subsequent analysis revealed that forced expiratory spirometric variables FEV₁ and FEV₁ to FVC ratio served as second order covariates with PaO₂SL to improve description of PaO₂ during hypoxia exposure for the combined samples (n = 42; p < 0.05). Analysis of residuals from regression analysis revealed approximately normal distribution. **CONCLUSIONS:** The PaO₂ relationships did not differ between the 15.1% HIT at sea level and hypobaric exposures of 2,438 m (8,000 feet) above sea level. Normal subjects and patients with COPD formed a single relationship. The present study extends descriptive models to a larger range of subjects. Regression models have definable accuracy in predicting PaO₂ during hypoxia exposure that increases with inclusion of spirometric variables.