

European Respiratory Society Annual Congress 2012

Abstract Number: 3240

Publication Number: P412

Abstract Group: 1.13. Clinical Problems - Other

Keyword 1: Lung function testing **Keyword 2:** Physiology **Keyword 3:** Nitric oxide

Title: The rise in carboxyhemoglobin and methemoglobin concentration from repeated five second breath-hold maneuvers

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Body: The measurement of pulmonary diffusing capacity for carbon monoxide (DLCO) raises the carboxyhemoglobin concentration in the blood, [COHb]. The standard 10 s breath-hold technique increases [COHb] by about 0.7% per test, which results in a 1% decrease in DLCO for every 1% rise in [COHb] (Respir Physiol, 1990, 81: 303-12). However, few data exist on the rate of increase in [COHb] or methemoglobin [METHb] from the modified Roughton and Forster one-step technique in which 0.28% CO and 40 to 50 ppm NO is inhaled simultaneously for 5 s. The combination of CO and NO inhaled together allows for determination of pulmonary capillary blood volume in a single breath-hold maneuver. Nine healthy subjects [24 (SD 4) yrs, hemoglobin concentration 13.2 (1.7) g/dL] performed repeated DLCO testing on two separate days. The days were randomized to provide either the standard 10 s breath-hold maneuver (0.30% CO), or the 5 s modified Roughton and Forster technique (0.28% CO, 55 ppm NO). Twenty-two 5 s breath-hold maneuvers, each separated by 4 min rest raised [COHb] to 11.1 (1.4)% and minimally raised the [METHb] to 0.8 (0.2)%. After the 22nd test, DLCO was reduced by 3.6 (2.9) mL/min/mmHg. This equates to a 0.44 (SEE 0.08)% increase in [COHb] per 5 s breath-hold maneuver and a concomitant 0.35 (SEE 0.31)% decrease in DLCO. Pulmonary diffusing capacity for nitric oxide (DLNO) was not altered after 22 tests. On another day, the 10 s single breath-hold maneuver increased [COHb] by 0.64 (SEE 0.13)% per test, and reduced DLCO by 0.40 (SEE 0.26)% per test. In conclusion, the 5 s modified one-step technique does not appreciably raise [METHb], and DLCO is only significantly reduced after 10 tests.