

CT and physiologic determinants of dyspnea and exercise capacity during the six-minute walk test in mild COPD

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Abstract

Objectives: We aimed to explore physiological responses to the six-minute walk test (6MWT) and assess computed tomographic (CT) features of the lungs and thigh muscle in order to determine contributors to dyspnea intensity and exercise limitation in dyspneic and non-dyspneic subjects with GOLD-1 COPD and controls. **Methods:** We compared Borg dyspnea ratings, ventilatory responses to 6MWT, and CT-measures of emphysema, airway lumen caliber, and cross-sectional area of the thigh muscle (RTMCT-CSA) in 19 dyspneic, 22 non-dyspneic, and 30 control subjects. **Results:** Dyspneic subjects walked less and experienced greater exertional breathlessness than non-dyspneic (105 m less and 2.4 Borg points more, respectively) and control subjects (94 m less and 2.6 Borg points more, respectively) ($P < .005$ for all comparisons). At rest, dyspneic subjects had significant greater expiratory airflow obstruction, air trapping, ventilation/perfusion mismatch, burden of emphysema, narrower airway lumen, and lower RTMCT-CSA than comparison subjects. During walking dyspneic subjects had a decreased inspiratory capacity (IC) along with high ventilatory demand. Dyspneic subjects exhibited higher end-exercise tidal expiratory flow limitation and oxygen saturation drop than comparison subjects. In regression analysis, dyspnea intensity was best explained by Δ IC and forced expiratory volume in 1 s %predicted. RTMCT-CSA and Δ IC were independent determinants of distance walked. **Conclusions:** Among subjects with mild COPD, those with daily-life dyspnea have worse exercise outcomes; distinct lung and thigh muscle morphologic features; and different pulmonary physiologic characteristics at rest and exercise. Δ IC was the main contributor to dyspnea intensity and Δ IC and thigh muscle wasting were determinants of exercise capacity..