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Title: Effect of tiotropium on spontaneous expiratory flow-volume curves during exercise in GOLD 1&2 COPD

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Body: Background: Progressive airflow limitation (PAL) during exercise involves dynamic airway compression (DAC) and is manifested in scooping of the spontaneous expiratory flow-volume curve (SEFVC). Aims: Examine: 1) shape changes of SEFVC during exercise and 2) tiotropium (tio) effect on flow limitation. Methods: Clinical trial NCT01072396: 18 µg qd tio effect on dynamic hyperinflation (DH) and exercise endurance in GOLD 1&2 COPD. SEFVC was recorded in 6 exercise tests of 20 pts with DH and 16 age-matched controls on a breath-by-breath basis. PAL was quantified by comparing area under the SEFVC relative to a rectangle spanning peak intrabreath and end-expiratory flow (rectangular area ratio [RAR]; Fig insert; Ma et al. Resp Med 2010;104:389–96). Results: 7 pts with DAC (baseline RAR≤0.5; Grp2) were mainly GOLD 2 (86%) and had worse obstruction vs pts without DAC (baseline RAR>0.5; Grp1; 31% GOLD 2). Grp1 vs 2 mean±SD: FEV₁ % pred, 79.6±10.1 vs 63.4±14.0, P=0.008; FEV₁/FVC, 59.9±5.6 vs 51.7±7.4, P=0.012. At peak exercise, tio significantly improved DAC in Grp2: RAR increased from 0.53±0.01 (mean±SEM) at baseline to 0.57±0.01 (Fig). Conclusions: RAR gave clear separation of controls vs Grp2 as a distinct phenotype during exercise. Tio improved DAC in Grp2. RAR calculation provides evidence of relief of exercise DAC assessed from recordings of spontaneous expiratory airflow without needing additional ventilatory manoeuvres.

