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Title: The effect of coexisting chronic heart failure (CHF) in exercise ventilatory inefficiency in patients with COPD

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Body: Background: Increase in “wasted” ventilation (VE) during exercise – as a consequence of large dead space to tidal volume ratio – is a common feature of chronic obstructive pulmonary disease (COPD) and CHF. Coexistence of COPD and CHF, therefore, could be associated with greater increases in exercise VE relative to both oxygen uptake (VO₂) and carbon dioxide output (VCO₂) compared to COPD alone.

Objective: To investigate the role of ventilatory inefficiency during incremental exercise in suggesting the presence of CHF in patients with established COPD. Methods: Twenty-four males (13 with COPD-CHF (FEV₁ = 59.6 ± 17.5 % pred; left ventricle ejection fraction (LVEF) = 34 ± 6 %) and 10 with COPD alone (FEV₁ = 48.6 ± 16.0 % pred; LVEF = 64 ± 4 %) were submitted to a ramp-incremental cardiopulmonary exercise test. Results: COPD-CHF patients had shallower $\Delta VO_2 / \Delta$ work rate (WR) and lower peak VO₂ than their counterparts (p<0.05). In line with our hypotheses, measures of excessive exercise ventilation relative to both VO₂ and VCO₂ were more disturbed in COPD-CHF than COPD patients ($\Delta VE / \Delta VCO_2 = 39 \pm 10$ vs. 30 ± 6 (p<0.05) and VO₂ efficiency slope (OUES, L/min/log) = 1.35 ± 0.38 vs. 1.76 ± 0.42 (p<0.01), respectively. In addition, decreases in $\Delta VO_2 / \Delta WR$ and OUES were more closely related to peak VO₂ in COPD-CHF than in COPD (r = 0.72 vs. 0.24 and 0.80 vs. 0.68, respectively). Conclusions: Pulmonary ventilation increases out of proportion of both VCO₂ and VO₂ during progressive exercise in COPD plus CHF patients compared to COPD alone. These results suggest that ventilatory inefficiency variables might be helpful in indicating the coexistence of CHF in COPD patients.