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Title: A newly developed sublingual tonometer and its validation in patients with chronic obstructive pulmonary disease

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Body: INTRODUCTION: chronic obstructive pulmonary disease (COPD) is a progressive, insidious disease with slow decline in lung function over many years. Respiratory failure is common in severe stage of COPD and blood gas analysis is required to asses this condition. AIM: in order to monitor the efficiency of ventilation, a simple, non–invasive, new sublingual method was developed. METHODS: to validate this method, measurements of carbon dioxide equilibration time using a sublingual tonometer were performed in vitro and in vivo. Tonometric values in volunteers under hyperventilation were also analysed as well as the agreement of parallel data in 42 COPD patients. The sublingual partial pressure of carbon dioxide (PslCO2) was compared to the partial pressure of carbon dioxide of arterialized blood samples (PaCO2) and exhaled breath carbon dioxide (PETCO2) in 10 healthy volunteers and 54 COPD patients. RESULTS: there was a close agreement (mean ± SD) between PslCO2 and PaCO2 (44.4±9.3 versus 42.7±7.7 mmHg) which did not change across disease severity (GOLD I–IV.) stages (PslCO2–PaCO2: I+II.: 0.8±4.5; III.: 2.3±6.7; IV.: 1.6±4.2 mmHg.). The agreement between the PslCO2 and PaCO2 was confirmed by Bland and Altman analysis (bias: 1.75 mmHg). Parallel measurements of PslCO2 proved the reproducibility of the method. CONCLUSION: this initial study demonstrates the feasibility of the method suggesting that sublingual tonometry deserves further consideration to be applied in clinical practice in COPD patients with respiratory failure.