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Title: Sensitivity of N₂ single breath washout (SBW) compared multiple breath washout (MBW) in adults with cystic fibrosis (CF)

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Body: Background: The N₂ MBW method is increasingly used in research studies to assess ventilation distribution inhomogeneity. In addition to global indices such as the lung clearance index (LCI), specific indices of inhomogeneity in the conducting airway zone (Scond) and more peripherally (Sacin) can be calculated (1). The MBW is, however, time consuming and N₂ SBW based on a single breath, either a vital capacity maneuver or a 1 litre inspiration of pure O₂ from functional residual capacity (FRC), are much quicker to perform. The sensitivities of these tests have not been compared before in CF. Methods: Spirometry and triplets of N₂ MBW, VC and FRC+1L SBW tests were recorded using the Exhalyzer D (Eco Medics AG) in 20 CF subjects aged 27(7) yrs and 20 healthy controls also aged 27 (7) yrs. From the SBW tests concentration and volume normalized phase III slopes (Sn_{III}*Vol,exp) were calculated. The results from the controls were used to calculate z-scores from the N₂ washout indices. Spirometry data were related to Swedish reference values (2-3). Results: LCI and Scond were abnormal (z > +1.96 SD) in all 20 subjects. Compared to LCI or Scond, Sacin was abnormal in only 12/20 subjects (p=0.003), VC Sn_{III}*Vol,exp in 13/20 (p=0.008), and FRC+1L Sn_{III}*Vol,exp in 18/20 subjects (n.s.). FEV₁ was abnormal (<-1.96 SD) in 6 only (p<0.001). Conclusion: LCI and Scond are the most sensitive indices, but a single breath test based on inspiration of 1 L of O₂ from FRC followed by a slow maximal expiration is almost as sensitive as Scond or LCI. References: 1. Respiration 2009; 78: 339. 2. Bull Eur Physiopatol Respir 1985; 21: 551. 3. Upsala J Med Sci 1986; 91: 299.