Abstract for DSPAP 2023

**Turning Lung Clearance Index on its head.** **Reference data for SF6 Multiple Breath Washout Derived Ventilation Distribution Efficiency (VDE)**

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**Introduction**

Cystic fibrosis (CF) lung disease is characterized by increased ventilation inhomogeneity (VI), as measured by multiple breath washout (MBW). Lung clearance index (LCI) is the most reported VI outcome. This study aimed to evaluate historically published reference equations for sulphur hexafluoride (SF6) MBW outcomes, to data collected using updated commercial SF6MBW equipment and to produce device specific equations if necessary.

**Method**

SF6MBW was performed in 327 healthy children aged 0.1-18.4 years (151 [46%] girls), 191 (58.4%) < 3 years. Z-scores were calculated from published reference equations (FRC and LCI) and multivariate linear regression performed to produce device specific reference equations. Due to increasing residual standard deviations with increasing LCI values, investigation of methods for improvement were investigated, based on the relationship between VI and dead space ventilation (VD/VT; dead space volume/tidal volume) in a cohort of 59 healthy children, 26 children with CF (n=138 test occasions) and 49 adults with lung disease.

**Results**

Historical SF6MBW reference equations were unsuitable for EXHALYZER D® data. In contrast to LCI and log10(LCI), 1/LCI (ventilation distribution efficiency; VDE) was linearly related to VD/VT, with z-scores linearly related to its absolute values. Reference equations were reported for VDE and log10(FRC). Significant predictors for VDE and log10(FRC), respectively, were log10(age) and gender, and log10(height), gender and posture.

**Conclusion**

VDE is potentially a better index of VI than LCI, particularly in more advanced CF lung disease and also for longitudinal monitoring. Further confirmatory clinical studies, particularly longitudinal imaging studies of structural or ventilatory changes, are warranted.