

WS13.5 Structural correlation of multiple breath washout indices derived from alveolar slope analysis in adult cystic fibrosis

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Objectives: Progressive airways obstruction is a key feature of cystic fibrosis (CF), which has its origins in the small airways. Lung clearance index (LCI) is a global measure of ventilatory heterogeneity. Scond and Sacin are derived from analysis of concentration-normalized phase III slopes of a multiple breath inert gas washout (MBW). The aim of the study was to assess the relationship of LCI, Scond and Sacin with structural lung disease using high resolution CT thorax (HRCT).

Methods: MBW, spirometry and plethysmography were performed in 19 CF adult patients (FEV₁ 26–119% of predicted). Bronchiectasis, bronchial wall thickening and gas trapping scored independently on HRCT by two radiologists were correlated with the physiological indices.

Results: FEV₁ and residual volume/total lung capacity ratio (RV/TLC) correlated with bronchiectasis extent (FEV₁ $r = -0.42$, $p < 0.05$; RV/TLC $r = 0.64$, $p < 0.01$) bronchial wall thickening (FEV₁ $r = -0.64$, $p < 0.01$; RV/TLC $r = 0.66$, $p < 0.01$) and gas trapping (FEV₁ $r = -0.75$, $p < 0.01$; RV/TLC $r = 0.69$, $p < 0.01$).

For MBW parameters, LCI correlated with bronchial wall thickening ($r = 0.63$, $p < 0.01$) and gas trapping ($r = 0.75$, $p < 0.01$), but not with bronchiectasis extent. Scond demonstrated no correlation with structural measures. Interestingly, Sacin correlated well with bronchiectasis ($r = 0.58$, $p < 0.01$), bronchial wall thickening ($r = 0.70$, $p < 0.01$) and gas trapping ($r = 0.55$, $p < 0.05$).

Conclusion: This study demonstrates Sacin and LCI correlate with structural lung disease. However, Sacin (a marker of acinar disease) predicts bronchiectasis extent better than LCI in this adult population. Scond may not be a useful parameter in CF adults.

WS13.6 Evidence of short-term acinar response following intravenous antibiotics therapy in adults with cystic fibrosis

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Background: Ventilation distribution indices have been suggested as alternative outcome measures for treatment interventions in Cystic Fibrosis, and heterogeneous improvements in the lung clearance index (LCI) have been reported in response to antibiotic therapy. In this work, we have investigated to what extent acinar and conductive lung zones contribute to potential lung function improvements following intravenous antibiotic therapy in acute pulmonary exacerbation.

Methods: 12 consecutive adult CF patients admitted for IV antibiotic treatment were recruited. Spirometry and Multiple Breath Washout (MBW) were performed on the day of admission and at discharge (8–14 days). From the MBW test, modified Sacin* and Scond* indices were derived to represent ventilation heterogeneity in acinar and conductive lung zones, respectively.

Results: Mean (\pm SD) age of the patients was 26 ± 5 years; 7 patients had chronic *Pseudomonas aeruginosa* colonization and 5 patients were known with CFRD. Upon admission, FEV₁ averaged $52 \pm 15\%$ pred and average LCI was 10.5 ± 1.2 . Mean CRP was 39 ± 32 . Considering the IV antibiotic induced changes, the correlation of DFEV₁ with DLCI did not reach significance ($r = -0.51$; $P = 0.09$), yet a significant correlation was observed between DFEV₁ and DSacin* ($r = -0.65$; $P = 0.02$). There was no correlation between DFEV₁ and DScond* ($P = 0.4$) or DCRP ($P = 0.7$). Finally, DLCI correlated with DSacin* ($r = +0.61$; $P = 0.03$) but not with DScond* ($P = 0.8$).

Conclusion: In those patients in whom a marked improvement in lung function can be obtained with IV antibiotics, the greatest beneficial effect is manifested as a decreasing ventilation heterogeneity in the acinar lung zone.