Assessment of ventilation inhomogeneity in patients with alpha-1-antitrypsin deficiency - A useful tool for monitoring early lung disease

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INTRODUCTION

The risk of developing alpha-1-antitrypsin deficiency (α1-AT deficiency) related emphysema during adulthood is high in patients with a PiZZ genotype. Currently, the FEV1 is used for detecting and monitoring α1-AT deficiency related lung disease. However it is likely that the early changes occur in peripheral airways that are not accessible by spirometry. Multiple breath washout (MBW) is a sensitive test for detecting ventilation inhomogeneity (VI) within the peripheral airways. VI can be quantified by calculating several indices such as the Lung Clearance Index (LCI).

AIM

The aim of the present study is to assess the clinical value of measuring the LCI in patients with α1-AT deficiency.

METHOD

Patients were recruited from the German Alpha 1 registry and through patient organisations. For this preliminary analyses, data sets from 3 centers were included.

RESULTS

46 patients with α1-AT deficiency and PiZZ genotype (6.4-73.4 years) and 40 healthy controls (6.9-84.4 years) were included in this preliminary analysis. Mean (SD) LCI was 10.50 (2.91) in patients with α1-AT deficiency and 6.5 (0.72) in controls. The mean difference (95% ci, p-value) of the LCI between the groups was -3.980 (-4.872; -3.089, <0.001). Within-test repeatability (CV%) was 7.2% in patients with α1-AT deficiency and 5.6% in controls. Correlation between LCI and age was significant in patients (p=<0.001) but not in controls (p= 0.076).

DISCUSSION

Assessment of LCI derived from MBW2 was feasible, reproducible and well tolerated in both, patients with α1-AT deficiency and controls. LCI differed significantly between patients and controls. Individual data demonstrated a marked discrimination between the groups. VI increased with age in patients. We conclude from these preliminary data that the LCI reflects the presence of VI and may be a useful additional lung function parameter in patients with α1-AT deficiency. However, further analyses will reveal the relation between LCI and other lung function parameters, particularly in early stages of disease.