

European Respiratory Society Annual Congress 2012

Abstract Number: 4038

Publication Number: 375

Abstract Group: 1.3. Imaging

Keyword 1: Imaging **Keyword 2:** COPD - mechanism **Keyword 3:** Gas exchange

Title: MRI of delayed-ventilation perfusion matching in COPD

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Body: Introduction Delayed ventilation in COPD may be caused by collateral ventilation, partial obstruction, lung hyperinflation or a mixture of such mechanisms, and allows initially-unventilated lung regions to become ventilated over time. Recently hyperpolarised gas MRI has been used to directly visualise delayed and collateral ventilation in COPD over the period of a single breath-hold. Delayed ventilation will only contribute to gas exchange if there is blood perfusion in these regions. Objective To image the perfusion matching of lung regions with delayed ventilation in COPD. Methods Ten patients with moderate to severe COPD as defined by NICE guidelines were scanned using ³He and proton MRI. Delayed-ventilation images; hyperpolarised ³He images with full lung coverage were acquired at six time-points during a single breath-hold. Contrast-enhanced perfusion images with full lung coverage were acquired at breath-hold. Results Regions of delayed-ventilation were perfused in some cases and were not perfused in others giving an indication of which areas remained active in gas exchange.

Example ventilation and perfusion images are shown in the figure. The defects with delayed-ventilation in patient A are not perfused, whereas the smaller defect in Patient B is perfused. Conclusions Hyperpolarised gas and proton MRI allow the visualisation of ventilation and perfusion matching, and may aid in the understanding of delayed-ventilation in COPD and its role in gas exchange.