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Title: Imaging of bronchodilator effects in COPD with hyperpolarised ^3He and ^1H MRI

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Body: Introduction A combination of hyperpolarised ^3He and ^1H MRI can provide high spatial resolution images of lung ventilation and blood perfusion, and measurements of lung emphysema. Objective To assess regional lung function response to bronchodilator in COPD. Methods 10 patients with moderate to severe COPD (NICE guidelines) were scanned using ^3He and ^1H MRI, before and after bronchodilator on two occasions. Quantitative MRI measures of ventilation, blood perfusion, apparent diffusion coefficient (ADC) and lung volume were calculated regionally and for the whole lung. Statistical analysis was carried out on the global measures. Results After bronchodilator there was a significant decrease in global lung volume suggesting reduced air trapping. No other global MRI measures showed significant change. However, regional changes in ventilation and perfusion were seen after bronchodilator; different lung regions showed different responses, which may account for the lack of significant change globally.

Mean ^3He ADC demonstrated excellent test-retest repeatability at baseline and inverse correlation with DLCO, suggesting that ADC is a reliable measure of emphysematous destruction which shows no change with bronchodilator. Conclusion Lung ventilation and perfusion assessment with ^3He and ^1H MRI showed regional variations in response to bronchodilator which were masked by whole lung measurements in this group of patients with moderate to severe COPD.