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Title: Quantifying lung function in COPD with hyperpolarised ^3He MRI

Mr. Samuel 18139 Janoff mda09sgj@shef.ac.uk ¹, Dr. Helen 18140 Marshall h.marshall@sheffield.ac.uk ¹, Dr. Martin 18141 Deppe m.deppe@shef.ac.uk ¹, Dr. Cath 18142 Billings Catherine.Billings@sth.nhs.uk ², Dr. Juan 18143 Parra-Robles j.parra-robles@sheffield.ac.uk ¹, Mrs. Sue 18149 Hillis susan.hillis@sth.nhs.uk ², Dr. Sam 18151 Miller Sam.R.Miller@gsk.com ³, Dr. David 18152 Lipson David.A.Lipson@gsk.com ⁴, Prof. Jim 18153 Wild j.m.wild@sheffield.ac.uk ¹ and Dr. Rod 18154 Lawson clavedoc@yahoo.co.uk MD ². ¹ Academic Radiology, University of Sheffield, United Kingdom ; ² Respiratory Medicine, Sheffield Teaching Hospitals NHS Trust, Sheffield, United Kingdom ; ³ GlaxoSmithKline, GlaxoSmithKline, Stokley Park, United Kingdom and ⁴ GlaxoSmithKline, GlaxoSmithKline, King of Prussia, United States .

Body: Introduction: Hyperpolarised ^3He MRI can identify regional lung defects and has been found more sensitive than spirometry to early changes in smokers lungs¹. We aim to quantify change in lung function in response to bronchodilator in COPD using ^3He MRI. Method: 10 patients with moderate to severe COPD (per NICE) were scanned pre and post bronchodilator at FRC+1L. Lung volume (LV) was defined by region growing algorithms (Slicer 3D, Harvard) on conventional ^1H MRI. Ventilated volume (VV) was defined by a threshold on ^3He MRI. Percentage ventilation (PV) was defined as $\text{VV} \div \text{LV}$. Lungs were segmented into 4 regions on each slice with large airways removed. Results: Change in ventilation, including recruitment of newly ventilated areas, was seen post treatment.

Regional analysis showed patterns of change in different lung areas which may be hidden in global measures. $\text{FEV}_1\%$ significantly increased post treatment ($p < 0.02$) suggesting geographical variation of lung recruitment significantly affects FEV_1 , as opposed to global change in gas flow.

Conclusions: Global MRI measures and spirometry simplify lungs to one unit. Regional analysis explains better change in lung function. 1.JMR21:365-9(2005).