Methods: As a part of an on-going collaboration between PneumCare Ltd. and Queen Elizabeth (QE) Hospital (Birmingham, UK), 107 healthy adult subjects between ages of 18 to 69 were measured with SLP during 4 to 5 minutes of seated tidal breathing. Parameter means and standard deviations for males and females aged 18–39 and 40–69 were calculated and gender and age related comparisons were made (t-test).

Results: Tables 1 summarises the normative values for males and females older and younger than 40 years. Three parameters showed age related differences and one parameter showed a gender related difference.

Conclusion: Preliminary normal values for SLP derived tidal breathing parameters are reported. Some gender and age related differences are apparent. It is interesting that tPTEF/tE was significantly lower in the older participants, possibly a sign of natural airway obstruction associated with age.

### P39
CTAS – A CT SCORE TO QUANTIFY DISEASE ACTIVITY IN PULMONARY SARCOIDOSIS

Introduction: A major gap in the management of sarcoidosis is the lack of accessible and objective methods to measure disease activity. Since 90% of patients have pulmonary involvement, we explored if a disease activity score based on thoracic CT scan could address this clinical issue.

Methods: High resolution CT scans from 100 consecutive sarcoidosis patients at a regional sarcoidosis service were scored for extent of CT abnormalities known to relate to granuloma or lymphocytic infiltration from published CT-pathological studies. These individual abnormality scores were then correlated against serum ACE, sIL-2R and change in forced vital capacity (FVC) to identify CT abnormalities that reflect contemporaneous disease activity. The sum of these scores, or CT Activity Score (CTAS) was then validated against FVC response to treatment.

Results and discussion: CT extent scores for nodularity, ground-glass opacification, inter-lobular septal thickening and consolidation correlated significantly with at least one of the disease activity parameters and were used to form CTAS. CTAS was found to predict FVC response to treatment at one year and was highly reproducible between radiologists. An abbreviated CTAS (aCTAS), constructed from presence or absence of the four CT abnormalities also showed significant correlation with FVC response to treatment. CTAS and aCTAS also correlated with response to treatment in the fibrotic subgroup.

Conclusions: CTAS provides a concept for an objective and reproducible CT scoring method to quantify disease activity in sarcoidosis. The score can potentially be used to stratify patients according to disease activity, determine response to treatment and establish if fibrotic sarcoidosis is active.

### P38
REPEATABILITY OF STRUCTURED LIGHT PLETHYSMOGRAPHY (SLP) FOR MEASUREMENT OF RESPIRATORY RATE IN NORMAL SUBJECTS

1 R Iles, 2W De Boer, 3A Khalid, 4S Motamed Fakhri, 2R Wilson. 1Cambridge University Hospitals Trust; Cambridge, UK; 2PneumCare Limited, Ely, UK

Introduction: Structured Light Plethysmography (SLP) captures movements of a light grid projected onto the thoraco-abdominal (TA) wall to produce a waveform from which a primary derived output is Respiratory Rate (RR). Assessment of repeatability is essential for clinical use, however, physiological variability can confound results. RR agrees within ±2 breaths per minute (brpm) with Respiratory Inductance Plethysmography (RIP) measured simultaneously on one occasion. We propose that if measurements are repeatable, there would be no difference in agreement between devices over a series of sessions.

Aim: This study assessed repeatability of the agreement between SLP and RIP.

Methods: 14 subjects (7 male, 7 female) with no respiratory diagnosis underwent 5 minutes of simultaneous measurement with SLP and RIP during quiet breathing. This was repeated on 3 occasions over 2 days, by the same operator, at the same location and using the same devices. RR were calculated for thorax (THRR), abdomen (ABRR) and the entire thoraco-abdominal (TARR) signals for both devices. Agreement between the two devices was assessed using Bland-Altman plots with LOA set at < ±2 breaths/min.

Results: For TARR and THRR, all points were within 2 SD of the mean; for ABRR, 1 of 14 points was outside of 2 SD, but the mean differences between the two devices were 0.476, 0.605 and 0.524 breaths/ min for TARR, THRR and ABRR, respectively.

Conclusion: Agreement was observed between the two devices for each set of repeated measurements. We conclude that measurement of RR are repeatable.

### P40
DEVELOPMENT OF 18F AND 68GA-LABELLED CYCLIC PEPTIDES FOR POSITRON EMISSION TOMOGRAPHY IMAGING OF αvβ6 IN IDIOPATHIC PULMONARY FIBROSIS

1 IA Thompson, 2J Domarkas, 3C Cawthorne, 5SJ Archibald, 5S Hart. 1Hull York Medical School, Hull, UK; 2University of Hull, Hull, UK

Biomarkers, capable of identifying the stage and aggressiveness of idiopathic pulmonary fibrosis (IPF) at the time of diagnosis, would improve the accuracy of prognostication and facilitate targeting anti-fibrotic drug therapy to patients who are most likely to benefit. The integrin αvβ6 is highly expressed in injured lung epithelium and is a key activator of transforming growth factor β (TGF-β), which plays a crucial role in the initiation and maintenance of fibrosis. Positron emission tomography (PET) imaging tracers that permit visualisation of lung αvβ6 expression have potential as novel therapeutic and prognostic biomarkers in IPF.

Several αvβ6 integrin-binding cyclic peptides were synthesised using solid phase supported peptide synthesis and functionalised...
via their N-terminus or side chain amino group with a 6-amino- or a 6-azidohexanoic acid spacer to provide a convenient attachment site for either 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid (DOTA) or an 2-ethyl-6-[18F]-fluoropyridine prosthetic group for radiolabelling with $^{68}$Ga or $^{18}$F, respectively. The $\alpha$, $\beta$, binding capability of these peptide derivatives was assessed by competitive binding enzyme-linked immunosorbent assay (ELISA) and flow cytometry. Peptide derivatives that displayed strong affinity for $\alpha$, $\beta$, were taken forward to "hot" cell surface binding experiments to evaluate their selectivity for the target. Stability of radiolabelled peptides was measured in human serum.

Competitive binding ELISA experiments (Figure 1) and flow cytometry experiments, showed that cRGD1 and cRGD4 were able to inhibit the binding of $\alpha$, $\beta$, specific 10D5 mAb to $\alpha$, $\beta$, with IC$_{50}$ values of 6.6 nM and 1.6 nM, respectively. Labelling cRGD1 and cRGD4 with fluorine and gallium resulted in IC$_{50}$ values of 12.2 nM and 1.2 nM for $^{19}$F-Pyr-cRGD1 and $^{68}$Ga-DOTA-cRGD4, respectively. Serum stability studies of $^{68}$Ga-DOTA-cRGD4 have shown that this tracer is >90% stable after 2 half-lives of $^{68}$Ga (136 min).

Radiolabelled cyclic RGD peptides have showed favourable binding and stability characteristics and warrant their investigation by PET imaging in vivo. A xenograft murine model using $\alpha$, $\beta$, + and $\alpha$, $\beta$, tumours is currently under development to validate tracer uptake and biodistribution in vivo.

Abstract P40 Figure 1 $\alpha$, $\beta$, competitive binding ELISA between labelled/non-labelled cyclic peptides and the $\alpha$, $\beta$, specific mAb (clone10D5)

P41

A PROSPECTIVE COHORT STUDY TO MEASURE IN-VIVO CHANGES IN LUNG GLUCOSE METABOLISM IN PATIENTS WITH SSCL-ILD USING FDG-PET

HS Garthwaite, V Holmes, T Mikolasch, G Azzopardi, CP Denton, AM Groves, JC Porter.
University College London, London, UK

10.1136/thoraxjnl-2016-209333.184

Background Systemic sclerosis (SSc) is a chronic inflammatory autoimmune rheumatic disease with a UK prevalence of 2–10 per 100,000. It is a heterogenous disease characterised by varying degrees of dermal and organ fibrosis. Interstitial lung disease (ILD) occurs in 60–80% of patients and ranges from mild, clinically trivial disease to extensive fibrosis that results in respiratory failure and premature death. Therapeutic options include cyclophosphamide, mycophenolate mofetil and rituximab. Clinical decisions are complex and decisions to treat or not have historically been based on radiology and lung function tests, neither of which (at a single time point) give a dynamic view of disease progression. Novel biomarkers are urgently needed to predict disease activity, progression and response to treatment in patients with SScl-ILD.

Aims To investigate the potential of 18Fluoro-deoxyglucose Positron Emission Tomography (FDG-PET)/CT to act as a prognostic and response biomarker in patients with SScl-ILD.

Methods 35 SSc-ILD patients were prospectively recruited for 18F-FDG-PET/CT. Patients were screened for lung involvement using clinical assessment, chest X-ray and pulmonary function testing (PFT). Those with confirmed SSc-ILD underwent combined high resolution CT scan (HRCT)/PET scanning. The imaging signal and clinical findings were correlated with the need for, and response to, therapy. Follow up was with clinical assessment, PFT and when a change in treatment was indicated, repeat imaging.

Results The overall maximum pulmonary uptake of 18F-FDG (SUVmax), the minimum pulmonary uptake or background-lung activity (SUVmin) and target-to-background (SUVmax/SUVmin) ratio (TBR) were quantified using routine region-of-interest analysis. Kaplan-Meir analysis was used to identify associations with disease progression and response to treatment.

Conclusions We have shown that high pulmonary uptake of 18F-FDG is associated with disease activity and progression in patients with SScl-ILD. These PET findings can be used to give additional information, supplemental to PFTs, which may then aid clinical treatment decisions.