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-tetraazaacyclododecane-1,4,7,10-tetraacetic acid (DOTA) or an 2-ethylhenyl-6-[18F]-fluoropyridine prosthetic group for radiolabelling with 68Ga or 18F, respectively. The $\alpha\beta_6$-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 $\alpha\beta_6$ 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 $\alpha\beta_6$-specific 10D5 mAb to $\alpha\beta_6$ with IC50 values of 6.6 nM and 1.6 nM, respectively. Labelling cRGD1 and cRGD4 with fluorine and gallium resulted in IC50 values of 12.2 nM and 1.2 nM for 19F-Pyr-cRGD1 and 68Ga-DOTA-cRGD4, respectively. Serum stability studies of 68Ga-DOTA-cRGD4 have shown that this tracer is >90% stable after 2 half-lives of 68Ga (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 $\alpha\beta_6^+$ and $\alpha\beta_6^-$ tumours is currently under development to validate tracer uptake and biodistribution in vivo.

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**Poster sessions**

**P44**

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

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**Background**

Systemic sclerosis (SSc) is a chronic inflammatory autoimmune rheumatic disease with a UK prevalence of 2–10 per 100,000. It is a heterogeneous 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, mycophenylate 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 SSc-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 SSc-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 SSc-ILD. These PET findings can be used to give additional information, supplemental to PFTs, which may then aid clinical treatment decisions.
controls. \( P = 0.92 \). Areas of normal lung in IPF patients exhibited increased 18\(^{F}\)-FDG uptake compared to controls measured by maximum SUV (0.98 ± 0.32 in IPF and 0.70 ± 0.20 in controls, \( P < 0.01 \)) and mean SUV (0.80 ± 0.29 in IPF and 0.57 ± 0.18 in controls, \( P < 0.01 \)).

**Conclusions** We confirm that in IPF, areas of normal appearing lung exhibit increased 18\(^{F}\)-FDG uptake as xenon is highly lipophilic, and can be used as a gas exchange probe. Aim We aimed to assess the feasibility and tolerability of 129\(^{Xe}\)-MRI in healthy adult volunteers.

**Method** This was a single centre prospective observational study. Ethical approval had been obtained. The volunteers had provided written informed consent. A GE 2000 polariser was used for production of hyperpolarised 129\(^{Xe}\), with a 1.5T GE MRI scanner for imaging.

The volunteers underwent a conventional MRI thorax, followed by 129\(^{Xe}\)-MRI of lungs. The inhaled volume of hyperpolarised 129\(^{Xe}\) ranged 0.6–1.0L. There was 30 minutes of observation with recording of vital signs, i.e., oxygen saturations (O2 satu), heart rate (HR), and blood pressure (BP) at 5, 10, 15, and 30 minutes post-inhalation of xenon, after each scan. Each visit comprised of a maximum of four scans.

**Results** Nine volunteers (male: female 8:1, aged 20–34) underwent 28 scan visits, comprising of 102 scans. 129\(^{Xe}\)-MRI was well-tolerated, with no serious adverse events. The polarisation achieved ranged 4.10–10.57\(^{\%}\).

To assess the impact of inhaling xenon on vital signs as a safety measure, the recorded vital signs were analysed using student’s \( t \)-test. There was no significant change in O2 satu or BP. The most notable change was noted in HR, which was persistently reduced following inhaling xenon (\( p < 0.001 \)). These changes were not deemed clinically significant.

We achieved good image quality (Figure 1). Spectroscopy distinguished lung tissue-dissolved xenon from blood-dissolved. Dissolved phase imaging (DPI) was obtained. The technique was reproducible.

**Discussion** The data demonstrates satisfactory feasibility and tolerability of 129\(^{Xe}\)-MRI. DPI can image regional gas exchange. 129\(^{Xe}\)-MRI may be used to develop biomarkers of disease progression, and assess drug efficacy, to personalise medicine, reduce healthcare costs, and lower cost and duration of drug development.

**Abstract P43 Figure 1** 25 mm coronal plane (top row) and axial plane 129\(^{Xe}\)-MRI of a healthy volunteer.