TLco: 39.2 ± 14.8 vs 39.9 ± 13.1 respectively, $p=n/s$) at the Royal Brompton Hospital was undertaken. Indices relating to airflow, dynamic and static lung volumes were compared. Data were analysed using parametric tests following testing for normal distribution and expressed as mean $\pm$ SD. A p -value < 0.05 was considered statistically significant.

Results Compared to patients with IPF, the CHP cohort was characterised by considerably worse small airway impairment as denoted by significantly lower %-predicted values of mid-expiratory flow ($MEF_{25/50/75}$; $p < 0.0001$), forced expiratory volume at 3 s (FEV_3 ; $p < 0.05$), volumic inspiratory and expiratory airway conductance (G_{AW}) as well as resistance (R_{AW}) ($p < 0.0001$). In contrast, indicators of greater air-trapping including residual volume/RV and the RV/TLC ratio were increased in CHP ($p < 0.0001$ and $p < 0.0001$ respectively) while contraction of total lung capacity occurred to a lesser extent in this group ($p = 0.01$). The gas transfer coefficient/Kco was lower in CHP than in IPF ($p = 0.01$).

Conclusion Although both diseases result in restrictive pulmonary physiology, patients with CHP have demonstrably worse small airway function than those with IPF, as evaluated by a range of flow and volume determinants. Consequent upon these changes, a higher degree of air-trapping is evident in the CHP cohort. The radiologic correlates of such observations, namely bronchocentric fibrosis and lobular air-trapping, are widely recognised in CHP. In future, integration of a more disease-specific physiologic profile with detailed assessment of disease behaviour, volumetric radiology and dynamic small airway tests may enhance the accuracy of diagnosing CHP.

S54 AUTOMATING THE ANALYSIS OF THORACIC CT SCANS IN CYSTIC LUNG DISEASE

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Introduction Certain disorders of the lung, such as Birt-Hogg-Dubé syndrome (BHD) and lymphangioleiomyomatosis (LAM), are characterised by the presence of multiple pulmonary cysts. Radiological analysis using thoracic computed tomography (CT) is the mainstay of diagnosis and follow-up of these disorders. The rate of change of the cysts contributes to therapeutic decisions including the prescription of potentially toxic therapies, most notably mTOR inhibitors in LAM. At present, cyst parameters including their location, size, shape and number are determined by the review of CT images by radiologists. Despite expert training, this process is prone to human error and susceptible to inter-observer disparity.

Objective We wished to determine if automation of cyst analysis could provide robust data to aid the radiologists in their reporting of thoracic CT scans.

Methods and Results Software was developed using C++ to extract data from standard Digital Imaging and Communications in Medicine (DICOM) CT files. For each scan, voxels in lung parenchyma or cysts were detected by radiodensity being in the range from -935 HU to -610 HU or below -935 HU, respectively. The 3D-cyst boundaries were identified by means of novel recursive algorithm (figure 1). Trachea and airways were automatically detected and excluded from further analysis. Number of cysts per patient was recorded and each cyst analysed in terms of volume, spatial location, sphericity

and cylindricity (calculated by using eigenvalues of gyration tensor for corresponding cyst) and opacity. The software was calibrated empirically through iterative adjustment of the above threshold values and comparison with scores generated by an expert thoracic radiologist thus enabling the reliable differentiation of cysts from noise. As proof-of-principle, the scans of 10 individuals with BHD and 10 with LAM were analysed in a blinded manner by the computer and compared with independent radiology reports.

Conclusion Automated image analysis provides a new set of objective cyst parameters and offers added value to the thoracic radiology reporting process. Future studies will determine the relative sensitivities of human vs. automated CT analysis in the diagnosis and monitoring of cystic lung diseases including BHD and LAM.

Abstract S54 Figure 1 Automated detection of lung cysts. 3D rendering of the thoracic CT scan of an individual with BHD following automated detection of cysts but prior to deletion of airways. Note irregular cysts with a preponderance below level of the carina.

S55 DERIVATION AND VALIDATION OF A SIMPLE LONGITUDINAL SCORE WHICH STRONGLY PREDICTS MORTALITY IN INTERSTITIAL LUNG DISEASE (ILD) ASSOCIATED PULMONARY HYPERTENSION (ILD-PH)

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Introduction Pulmonary hypertension commonly occurs in ILD, and is a malignant prognostic factor. Predicting mortality in this group remains problematic. We hypothesised that a combination of baseline demographics and longitudinal change in PFT's and the biomarker brain-natriuretic peptide (BNP) would predict mortality in ILD-PH.

Methods Demographics, ILD subtype, PFTs, echocardiogram, and CTs were reviewed in consecutive patients undergoing