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Radiomic measures from chest high-resolution computed tomography associated with lung function in sarcoidosis

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ABSTRACT

Introduction: Pulmonary sarcoidosis is a rare heterogeneous lung disease of unknown aetiology, with limited treatment options. Phenotyping relies on clinical testing including visual scoring of chest radiographs. Objective radiomic measures from high-resolution computed tomography (HRCT) may provide additional information to assess disease status. As the first radiomics analysis in sarcoidosis, we investigate the potential of radiomic measures as biomarkers for sarcoidosis, by assessing 1) differences in HRCT between sarcoidosis subjects and healthy controls, 2) associations between radiomic measures and spirometry, and 3) trends between Scadding stages.

Methods: Radiomic features were computed on HRCT in three anatomical planes. Linear regression compared global radiomic features between sarcoidosis subjects (n=73) and healthy controls (n=78), and identified associations with spirometry. Spatial differences in associations across the lung were investigated using functional data analysis. A subanalysis compared radiomic features between Scadding stages.

Results: Global radiomic measures differed significantly between sarcoidosis subjects and controls (p<0.001 for skewness, kurtosis, fractal dimension and Geary's *C*), with differences in spatial radiomics most apparent in superior and lateral regions. In sarcoidosis subjects, there were significant associations between radiomic measures and spirometry, with a large association found between Geary's *C* and forced vital capacity (FVC) (p=0.008). Global radiomic measures differed significantly between Scadding stages (p<0.032), albeit nonlinearly, with stage IV having more extreme radiomic values. Radiomics explained 71.1% of the variability in FVC compared with 51.4% by Scadding staging alone.

Conclusions: Radiomic HRCT measures objectively differentiate disease abnormalities, associate with lung

function and identify trends in Scadding stage, showing promise as quantitative biomarkers for pulmonary sarcoidosis.