**High resolution CT-based characterization analysis of idiopathic pulmonary fibrosis**

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Also need to include Auckland City Hospital collabarators who provided the IPF data (any funding?)

**Introduction**

Idiopathic pulmonary fibrosis (IPF) has is the most aggressive and frequently occuring form of idiopathic interstitial pneumonias. It is a chronic and life-threatening disease of unknown cause, and occurs primarily in middle-aged and elderly adults. Progression of IPF is variable between individuals is variable and unpredictable with few tissue-level biomarkers for progression identified. We propose a CT based classification analysis of IPF lung disease as a step toward a robust and consistent IPF assessment and diagnosis system. We aim to analyze and characterize IPF tissue abnormalities over time using quantitative methods.

**Method**

Tissue regions in HRCT images from X patients with IPF were quantitatively analysed and compared with X normal elderly subjects. IPF tissue was classified using CALIPER (Computer-Aided Lung Informatics for Pathology Evaluation and Ratings) software. The classified data were mapped to a statistical shape model, which allows consistentcomparison between different patients or within one patient over time. Tissue density,tissue volume, spatial distribution of abnormalities changes over time were analyzed using the classified mapped data. A principal component analysis (PCA) was applied to assess lung shape variation between cohorts.s.

**Result**

The result shows quantitatively that fibrosis usually has a consistently higher tissue density compared to normal tissue over time, and mainly locates in the lower lobes basally and peripherally. In contrast, emphysema has lower density values and appears in upper lobes often. Most IPF patients experience a decreaseof lung volume, although there is no significant shape difference between old normal persons and IPF ones. Meanwhile different kind of disease could transform mutually over time.

**Conclusion**

The tissue density, tissue volume, and the location of abnormality are all important indexes for representing a quantitative statistical progression of IPF disease. This quantitative analysis would provide consistent potential tissue-level markers to help with the further modeling of mechanical ventilation/perfusion mismatch and impaired gas exchange.