

LTRC Concept Sheet # 07-05-0001

Correlation of Pulmonary CT Semi-Quantitative and Quantitative Parenchymal and Airway Measures with Clinical, Physiologic and Pathological Data in LTRC patients with COPD

ABSTRACT

The purpose of the Lung Tissue Research Consortium (LTRC) is to enable better characterization and management of lung diseases by increasing understanding of chronic obstructive pulmonary disease (COPD) through creation of a repository containing in-depth clinical data, radiological data and tissue samples. It is hoped that the understanding of the pathogenetic mechanisms of disease can be increased by through studies that utilize this data.

Part of the disease characterization provided to the LTRC by the Radiology Core Laboratory (RCL) includes quantitative measures of lung tissue on volumetric high-resolution CT scans. The RCL goal is to show a relationship between these mathematical image features with specific visual features and extent of pulmonary disease.

The RCL laboratory has produced software for the 3-dimensional analysis, histogram measurement and quantification of airway characteristics for volumetric high-resolution CT data. Preliminary data from our laboratory suggests that quantitative and mathematical measures of volumetric high-resolution chest CT data and quantitative measurement of airway thickness correspond to specific visual features of disease. The overall extent of disease can be quantified and should correlate with changes in physiologic data. Even 'gold standard' pulmonary function data is highly influenced by patient effort and repetitive lung tissue sampling to assess pathological changes is invasive and potentially harmful. In addition, subtle changes in extent of pulmonary involvement are difficult to visually assess on radiographic studies. Therefore, an automated non-invasive quantitative measure which can be used as a tool for objective assessment of disease progression or response to therapy has potentially large clinical utility.

We hypothesize that these mathematical features should correlate with clinical and physiological manifestations of disease recorded in the LTRC database. To prove this correlation, we propose a statistical analysis of these measures through comparison of quantitative measures performed by the RCL with the radiologist interpretation, pulmonary function data, pathological and clinical diagnoses stored within the LTRC repository.