

Computerized Processing and Analysis of CT Images for Developing a New Criterion in COPD Diagnosis

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is one of the most prevalent and dangerous pulmonary diseases in the world. It is forecasted that COPD will be the third deadly disease in the future. Therefore, developing non-invasive methods for diagnosis of the disease would be helpful for physicians and patients.

Methods: Based on clinical investigations and spirometry tests, ten adult patients with COPD (6 male and 4 female) with mean age of 49.8 years were enrolled as the case group. In addition, ten age and sex-matched healthy, non-COPD individuals (6 male and 4 female) with mean age of 45.4 years were recruited as the controls. Lung CT-scan images of the subjects were processed and analyzed by a computer to find a relationship.

Findings: The elasticity of lung parenchyma variation was obtained with digital image processing. The normalized average of this pattern was found to be 21.6% in patients and 40.7% in controls. In addition, normalized mean value of Hounsfield unit variations in square 10 pixel × 10 pixel windows in the expiratory images were calculated as a parameter of air-trapping in COPD. Differences between the groups were shown by student t-test ($P < 0.05$).

Conclusion: This study showed that the variation of lung parenchyma elasticity and Hounsfield units are found by processing and analysis of the full inspiration and expiration images. These factors can be used as criteria in diagnosis of COPD. Moreover, the severity of the disease can be presented by the proposed method.

Keywords: Air-trapping, Chronic obstructive pulmonary disease, Image processing and analysis, CT-scan lung images

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