MR Signal Intensity changes of the lung parenchyma; Comparison with pulmonary function test and quantitative CT evaluation

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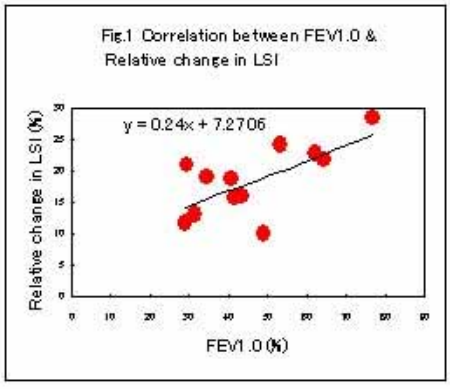
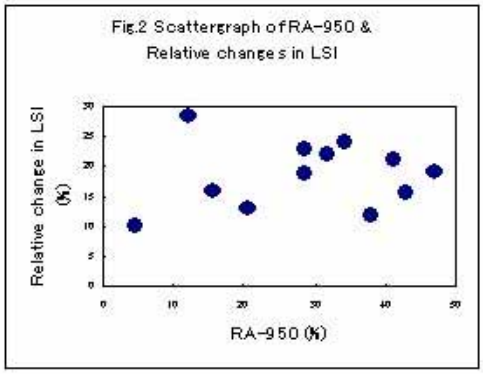
Purpose: To evaluate whether ventilatory impairment influence the relative changes in MR signal intensity of the lung parenchyma (relative changes in LSI).

Materials and methods: Subjects were 5 normal volunteers (mean age, 38±7.4, mean ±SD) and 12 male patients with chronic obstructive lung disease (COPD) (mean age, 72.6±6.2).MR, CT and pulmonary function tests (PFTs) were performed on the same day in every subject. CT images and images with 1mm slice thickness of the whole lungs were obtained with full inspiration using a multi-detector row CT scanner. We measured the percentage of relative lung area occupied by attenuation values of less than -950 HU (RA-950) [1]. All MRI studies were performed on a 1.5T system. Coronal images with 15mm-slice thickness were obtained over entire lungs with full inspiration and full expiration with cardiac triggering. The sequence was a multiple inversion recovery sequence (echo spacing, 4.2msec; TI1, 800msec; TI2, 150 msec) with a half-Fourier acquisition single-shot turbo spin-echo acquisition [2]. Whole lung fields were manually traced and the mean lung intensities of the whole lung parenchyma were calculated. Changes in the mean lung intensity between two respiratory states were normalized using the intercepts of linear regression lines of the signal changes [2]. We used the data of PFTs for these calculations. This study was approved by the internal review board of our institution, written informed consent was obtained from all patients.

Results: Relative changes in LSI in the patients was smaller than those in normal volunteers; average was 46.3±1.8 % in normal volunteer and 18.5±5.2% in the patients. In the patients relative change in LSI showed a significant correlation to forced expiratory volume in one second (FEV1.0) (p=0.043) (Fig1). There was no significant correlation between RA-950 and relative change in LSI (Fig 2).

Conclusion: Relative changes in LSI would be affected by ventilatory impairment, however, it would not be identical to the emphysematous lung volume evaluated by RA-950.





References [1] Banker AA, Radiology. 1999;211(3):851-8. [2] Bankier AA, et al. Magn Reson Imaging. 2004;20 (6):961-6.