

SS 10 CH-10 17:30

The feasibility of three-dimensional CT densitometry to evaluate early pulmonary functional recovery after bilateral lung transplantation: comparison with the pulmonary function test

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PURPOSE: To evaluate the feasibility of 3-dimensional (3D) computed tomography (CT) densitometry in the assessment of the early pulmonary performance of transplanted lungs.

MATERIALS AND METHODS: We enrolled 18 patients who underwent sequentially thoracic CT scan and pulmonary function test (PFT) at 1, 3, and 6 months after bilateral lung transplantation, in absence of acute rejection or infection. The transplanted lungs were reconstructed as a 3D model on a commercial workstation, with a threshold of -500 HU. By analysis of histograms, the proportions of lung volumes with attenuation values below -950 and -900 HU were measured. These values were compared with data from PFT.

RESULTS: Correlation was reasonable between 3D CT densitometric quantitations except the emphysema (< -950 HU) and, the forced expiratory volume in 1 second (FEV_1) ($r = 0.65$, $p < 0.05$) and the ratio of FEV_1 to forced vital capacity (FVC) ($r = 0.61$, $p < 0.05$). After operation, mean FEV_1 of transplanted lungs at 6 months was improved by 42% over the baseline value at 1 month. 10 patients who achieved above the average of pulmonary function recovery at 6 months tended to show greater than 1,900 cc in the lung volume reconstructed with a threshold of -500 HU, regardless of the proportions of the reconstructed lung volume on 3D CT densitometry obtained at 1 month after transplantation.

CONCLUSION: Lung densitometry with 3D reconstruction of helical CT data can be useful to assess and predict the early functional recovery of transplanted lungs.