

Measurement of heterogeneous distribution on Technegas SPECT images by three-dimensional fractal analysis

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This review article describes a method for quantifying heterogeneous distribution on Technegas (^{99m}Tc -carbon particle radioaerosol) SPECT images by three-dimensional fractal analysis (3D-FA). Technegas SPECT was performed to quantify the severity of pulmonary emphysema. We delineated the SPECT images by using five cut-offs (15, 20, 25, 30 and 35% of the maximal voxel radioactivity), and measured the total number of voxels in the areas surrounded by the contours obtained with each cut-off level. We calculated fractal dimensions from the relationship between the total number of voxels and the cut-off levels transformed into natural logarithms. The fractal dimension derived from 3D-FA is the relative and objective measurement, which can assess the heterogeneous distribution on Technegas SPECT images. The fractal dimension strongly correlate pulmonary function in patients with emphysema and well documented the overall and regional severity of emphysema.

Key words: heterogeneity, SPECT, Technegas, fractal analysis, pulmonary emphysema