

Technical and analytical advances in pulmonary ventilation SPECT with xenon-133 gas and Tc-99m-Technegas

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This paper describes the recent advances in technical and analytical methods in pulmonary ventilation SPECT studies, including a respiratory-gated image acquisition of Technetium-99m (^{99m}Tc)-labeled Technegas SPECT, a fusion image between Technegas SPECT and chest CT images created by a fully automatic image registration algorithm, and a three-dimensional (3D) display of xenon-133 (^{133}Xe) gas SPECT data, and new analytical approaches by means of fractal analysis or the coefficient of variations of the pixel counts for Technegas SPECT data. The respiratory-gated image acquisition can partly eliminate problematic effects of the SPECT images obtained during non-breath-hold. The fusion image is available for routine clinical use, and provides complementary information on function and anatomy. The 3D displays of dynamic ^{133}Xe SPECT data are helpful for accurate perception of the anatomic extent and locations of impaired ventilation, and the assessment of the severity of ventilation abnormalities. The new analytical approaches facilitate the objective assessment of the degrees of ventilation abnormalities.

Key words: radionuclide imaging, lung ventilation, single photon emission computed tomography (SPECT), xenon-133 gas, Tc-99m-Technegas