

Summary

Quantitative Evaluation for Scatter and Attenuation Correction in ^{99m}Tc SPECT —Multicenter Cooperation Phantom Study—

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A multicenter cooperation phantom study was conducted to evaluate the accuracy of a triple energy window scatter correction technique in combination with various attenuation correction methods for ^{99m}Tc single photon emission computed tomography (SPECT) imaging. Six centers participated in this research and the data obtained with seven SPECT instruments were analyzed. The phantom used in the experiment was a 20×10 cm cylinder filled with homogeneous ^{99m}Tc solution, containing two kinds of cold spots (cold rod phantoms). One had a water-filled cylinder 5.5 cm in diameter positioned 2.5 cm from the center. The other contained 6 water-filled cylinders of various sizes. Contrasts of cold regions were in the range from 74% to 120% (true 100%). Another phantom had the shape of a pie-chart divided

into six chambers symmetrically positioned in a cylinder 20 cm in diameter and 10 cm in height. Each chamber had volume of 480 ml and contained homogeneous ^{99m}Tc solution of different concentrations. This phantom was used to test for linearity between the radio activity concentration and reconstructed count density (linearity phantom). The intercept of the regression line obtained from the linearity phantom was 8.4 kBq ml^{-1} without scatter correction and -6.8 kBq ml^{-1} with scatter correction. Contrast was in the range from 78% to 132% (true 100%). The mean relative error for the measured activity concentration was $4.9\% \pm 3.5\%$ (mean \pm sd).

Key words: ^{99m}Tc single photon emission CT, Triple energy window scatter correction, Attenuation correction, Phantom study.