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Effects of Fe as a physical filter on spectra of Technitium- 99m, uniformity, system volume sensitivity and spatial resolution of Philip ADAC Forte dual-head gamma camera (Conference Paper)

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Abstract

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Single photon emission computed tomography (SPECT) imaging inherits some limitations, i.e., due to scattered gamma photons which degrade spatial resolution causes poor image quality. This study attempts to reduce a fraction of scattered gamma photons before reaching gamma camera detector by using Fe sheet (0.35 mm and 0.40 mm) as a physical filter. Also investigate the effects on spectra of Tc-99m, spatial resolution, system volume sensitivity and uniformity. The thickness of Fe physical filter is selected on the basis of percentage attenuation calculations of different gamma ray energies by various thicknesses of material. Data were acquired using Philip ADAC forte dual-head gamma camera without and with physical filter with LEHR collimator installed. For spectra, uniformity and system volume sensitivity, a cylindrical source tank filled with water added with Tc-99m was scanned. Uniformity and system volume sensitivity images were reconstructed with FBP method by applying Butterworth filter of order 5, cut-off frequency 0.35 cycles/cm and Chang's attenuation correction method using 0.13 cm^{-1} linear attenuation coefficient. Spatial resolution study was done by scanning a line source (0.8 mm inner diameter) of Tc-99m at various source-to-collimator distances in air and in scattering medium without and with physical filter. A substantial reduction in count rate from Compton and photopeak regions of Tc-99m spectra with physical filter is recorded. Improvement in spatial resolution with physical filter up to 4 cm source-to-collimator distance is obtained. System volume sensitivity was reduced and no improvement in uniformity. These thicknesses of physical filter may be tested further by scanning different planar/SPECT phantoms in Tc-99m imaging. © Published under licence by IOP Publishing Ltd.

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