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Image quality enhancement by reducing scattered gamma photons with a flat sheet of Zinc 0.35 mm thick material filter in Tc-99m SPECT (Conference Paper)

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Abstract

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One of the limitations of single photon emission computed tomography (SPECT) is the presence of signals of noise in image data which degrade image quality. There are different sources of noise and one of them is the detection of scattered gamma photons in the SPECT projection data. Therefore, Zinc (Zn) material filter of 0.35mm thickness was used to preferentially absorb scattered gamma photons from reaching the detector of gamma camera. SPECT data were acquired by using Phillips ADAC Forte dual head gamma camera with and without material filter. Standard energy window (20%) centered at 140 keV over the photopeak of Tc-99m was adjusted. For data acquisition 128x128 matrix was selected. The Tc-99m radioactivity of 22.5 mCi was injected into the Carlson's phantom. An insert placed into the phantom consisting of various sizes of hot regions was scanned. Material filter was installed on the outer surface of the collimator of gamma camera. Images were reconstructed by using filtered back projection method. Butterworth filter of cut-off frequency 0.35 cycle/cm and order 5 was chosen. Chang's attenuation correction on the data was applied. Hot region images were analyzed in terms of contour/visual, hot regions detectability, contrast and signal-to-noise ratio (SNR). Results of our work show enhancement in the detectability and contrast of smaller hot region with material filter. Increase in SNR of both large and small size hot regions with material filter as compared to without material filter. It is concluded that, material filter technique can assist clinicians in making correct decisions in detecting smaller hot lesions in Tc-99m clinical SPECT. However, more studies are required to validate its utility by scanning organ phantoms. © 2017 IEEE.

SciVal Topic Prominence

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Engineering main heading:

Signal to noise ratio

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