ORIGINAL ARTICLE

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Optimum energy window setting on Hg-201 x-rays photopeak for effective Tl-201 imaging

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For more effective Tl-201 imaging, the location and width of the energy window set on the Hg-201 x-rays photopeak was investigated using Monte Carlo simulation and phantom experiments. We calculated energy spectra and investigated the amount of primary and scattered photons within various energy windows set on the x-rays photopeak. The energy resolution (ER) at 71 keV (the peak of the x-rays photopeak) was changed to 10%, 12%, 14% and 16%. The relationships between the energy window and the primary counts rate or the scatter fraction (= scattered counts/primary counts, SF) were obtained. By compromise between the primary counts rate and the SF for ER = 12%, the optimum energy window was determined as a wider off-peak window, 77 keV ± 14.3% (66–88 keV). This off-peak window increased the primary counts rate by 12.5% and decreased the SF by ~17% as compared with the conventional on-peak energy window (71 keV ± 10%, 64–78 keV). When this off-peak widow acquisition was compared with the conventional on-peak window one on a gamma camera, planar and SPECT images using the off-peak widow clearly showed superior results qualitatively and quantitatively.

Key words: Tl-201 imaging, Hg-201 x-rays photopeak, off-peak energy window, Monte Carlo simulation, phantom experiment