**ORIGINAL ARTICLE**

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# Dependency of energy and spatial distributions of photons on edge of object in brain SPECT

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***Objectives:*** Accurate $\mu$ maps are important for quantitative image reconstruction in SPECT. The Compton scatter energy window (CSW) technique has been proposed to define the outline of objects. In this technique, a lower energy window image is acquired in addition to the main photopeak energy window. The image of the lower energy window is used to estimate the edge of the scanned object to produce a constant attenuation map. The aim of this study was to investigate the dependency of CSW on the spatial and energy distribution of radioisotope to predict the edges of objects. ***Methods:*** Two particular cases of brain study were considered, namely uniform distribution and non-uniform distribution using Monte Carlo simulation and experiments with uniform cylindrical phantom and hotspot phantom. The phantoms were filled with water and a radioactive solution of $^{99m}$Tc. For each phantom, 20%, 30%, 40% and 50% thresholds of the mean profile were applied to estimate $E_{wt}$, the energy window for minimum difference between the estimated and true edge of objects. ***Results:*** The $E_{wt}$'s were 100–120 keV with a 40% threshold and 92–114 keV with a 30% threshold for uniform and hotspot phantoms, respectively. ***Conclusions:*** Edge of the objects with CSW technique varies with energy window and thresholds. Careful setting of the energy window is required to use the CSW technique.

**Key words:** attenuation map, SPECT quantification, Compton scatter energy window, edge of object, threshold