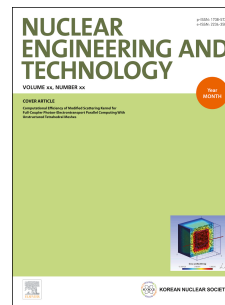


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Comparison of Image Uniformity with Photon Counting and Conventional Scintillation SPECT System: a Monte Carlo Simulation Study

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ABSTRACT

To avoid the artifact and the interpretation mistakes, an improvement of the uniformity in gamma camera system is very important point. We can expect excellent uniformity by using cadmium zinc telluride (CZT) photon counting detector (PCD) because of the direct conversion of the gamma rays energy into the electrons. Also, the uniformity performance such as integral uniformity (IU), differential uniformity (DU), scatter fraction (SF) and contrast-to-noise ratio (CNR) varies according to the energy window setting. In this study, we compared between PCD and conventional scintillation detector with respect to the energy windows (5%, 10%, 15% and 20%) using a ^{99m}Tc gamma source with Geant4 Application for Tomography Emission (GATE) simulation tool. The gamma camera systems used in the present study are a CZT PCD and NaI(Tl) conventional scintillation detector with a 1-mm thickness. According to the results, although the IU and DU results were improved with the energy window, the SF and CNR results were deteriorated with the energy window. In particle, the uniformity for the PCD was higher than that of the conventional scintillation detector in all cases. In conclusion, our results demonstrated that the uniformity of the CZT PCD was higher than that of conventional scintillation detector.

Keywords: Medical application; Nuclear medicine; SPECT system; Photon counting detector; Scintillation detector; Monte Carlo simulation

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