

Summary

Feasibility Study of SPECT Quantification Using CdTe Semiconductor Detector

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Quantification of SPECT using CdTe semiconductors as a detector head in nuclear medicine equipment was investigated. A prototype of semiconductor detectors with an effective field-of-view as small as 2.54 cm \times 5.08 cm was constructed, and a cylindrical phantom containing four spherical phantoms with capacities 71, 56, 42, and 15 ml, was used. Water was placed in three of these spherical phantoms (71, 56, and 42 ml), and 8.362 MBq of ^{99m}Tc was poured into the remaining 15 ml phantom. In the outer cylindrical phantom, 925 MBq (6200 ml) of ^{99m}Tc was placed. A Toshiba LEHR (Low Energy High Resolution) collimator was attached to the semiconductor detectors, and SPECT acquisition with a rotation radius 132 mm was performed.

It was found that in the data thus acquired using the

semiconductor detector, the amount of scattered γ -rays decreased by 33% as compared to data acquired using NaI(Tl) scintillators under the same condition. Moreover, when attenuation correction was applied to SPECT data from the CdTe semiconductor detector, the measurement accuracy of radioactivity improved by 16% as compared to SPECT data from NaI(Tl) scintillators with the same acquisition and post-correction conditions. Finally, the CdTe detector data with only attenuation correction was found to have almost the same grade of accuracy as NaI scintillator data with both attenuation and TEW scatter corrections

Key words: Semiconductor detector, Gamma camera, Scatter, Attenuation, Quantification.