ORIGINAL ARTICLE

Annals of Nuclear Medicine Vol. 18, No. 4, 315–322, 2004

Attenuation correction using asymmetric fanbeam transmission CT on two-head SPECT system

Akihiro KOJIMA,* Seiji TOMIGUCHI,** Koichi KAWANAKA,** Daisuke UTSUNOMIYA,** Shinya SHIRAISHI,** Takeshi NAKAURA,** Noboru KATSUDA,** Masanori MATSUMOTO,*** Yasuyuki YAMASHITA,** Nobutoku MOTOMURA**** and Takashi ICHIHARA****

**Institute of Resource Development and Analysis, Kumamoto University*
***Department of Radiology, Kumamoto University School of Medicine*
****Course of Radiological Sciences, Kumamoto University School of Health Sciences*
*****Toshiba Medical Systems Corporation*

For transmission computed tomography (TCT) systems using a centered transmission source with a fan-beam collimator, the transmission projection data are truncated. To achieve sufficiently large imaging field of view (FOV), we have designed the combination of an asymmetric fan-beam (AsF) collimator and a small uncollimated sheet-source for TCT, and implemented AsF sampling on a two-head SPECT system. The purpose of this study is to evaluate the feasibility of our TCT method for quantitative emission computed tomography (ECT) in clinical application. Sequential Tc-99m transmission and Tl-201 emission data acquisition were performed in a cardiac phantom (30 cm in width) with a myocardial chamber and a patient study. Tc-99m of 185 MBq was used as the transmission source. Both the ECT and TCT images were reconstructed with the filtered back-projection method after scatter correction with the triple energy window (TEW) method. The attenuation corrected transaxial images were iteratively reconstructed with the Chang algorithm utilizing the attenuation coefficient map computed from the TCT data. In this AsF sampling geometry, an imaging FOV of 50 cm was yielded. The attenuated regions appeared normal on the scatter and attenuation corrected (SAC) images in the phantom and patient study. The good quantitative accuracy on the SAC images was also confirmed by the measurement of the Tl-201 radioactivity in the myocardial chamber in the phantom study. The AsF collimation geometry that we have proposed in this study makes it easy to realize TCT data acquisition on the two-head SPECT system and to perform quantification on Tl-201 myocardial SPECT.

Key words: asymmetric fan-beam collimator, attenuation correction, transmission computed tomography, two-head SPECT system, Tl-201 myocardial SPECT