

Influence of photon scattering and attenuation on ROI analysis in brain perfusion single-photon emission tomographic imaging of normal subjects

Jingming BAI,* Jun HASHIMOTO,* Koichi OGAWA,** Atsushi KUBO,* Atsushi FUKUNAGA,***
Satoshi ONOZUKA*** and Koichi Uchida***

*Department of Radiology, School of Medicine, Keio University

**Department of Electrical Engineering, College of Engineering, Hosei University

***Department of Neurosurgery, School of Medicine, Keio University

Objective: The aim of this study was to evaluate the effect of scatter and attenuation correction in region of interest (ROI) analysis in brain perfusion single-photon emission tomography (SPECT) and to assess the influence of selecting the reference area on semi-quantification. **Methods:** Ten normal subjects were enrolled and injected with ^{123}I -iodoamphetamine to undergo simultaneous emission and transmission scanning for scatter and attenuation correction. We reconstructed three SPECT images from common projection data of each subject: with scatter correction and non-uniform attenuation correction, with scatter correction and uniform attenuation correction, and with uniform attenuation correction applied to data without scatter correction. A program for automated ROI drawing was used to set ROIs on various regions in brain images. Regional count ratios were compared in images with different correction procedures by using three different reference areas. **Results:** The effect of the combination of scatter and attenuation correction was marked in the precentral, temporal, posterior, hippocampus and especially in the cerebellum. In contrast, it was not appreciable in the central and parietal areas. When using the cerebellar ROI as the reference, the count ratio varied widely depending on the correction procedures. On the other hand, the whole brain reference offered the least variation in the count ratio. **Conclusions:** The influence of photon scattering and attenuation was dependent on regions. Since the count in the cerebellar ROI is greatly affected by photon scattering and attenuation, nonuniform attenuation correction combined with scatter correction deserves consideration when using the cerebellar ROI as the reference.

Key words: brain perfusion, brain SPECT, scatter correction, attenuation correction, transmission CT