

Database of normal human cerebral blood flow measured by SPECT: I. Comparison between I-123-IMP, Tc-99m-HMPAO, and Tc-99m-ECD as referred with O-15 labeled water PET and voxel-based morphometry

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Objectives: Three accumulative tracers, iodine-123-labeled *N*-isopropyl-*p*-iodoamphetamine (I-123-IMP), technetium-99m-labeled hexamethylpropyleneamineoxime (Tc-99m-HMPAO), and technetium-99m-labeled ethyl cysteinate dimer (Tc-99m-ECD) are widely used to measure cerebral blood flow (CBF) in single-photon emission computed tomography (SPECT). In the present study, normal regional distribution of CBF measured with three different SPECT tracers was entered into a database and compared with regional distribution of CBF measured by positron emission tomography (PET) with H₂¹⁵O. The regional distribution of tissue fractions of gray matter determined by voxel-based morphometry was also compared with SPECT and PET CBF distributions. **Methods:** SPECT studies with I-123-IMP, Tc-99m-HMPAO, and Tc-99m-ECD were performed on 11, 20, and 17 healthy subjects, respectively. PET studies were performed on 11 healthy subjects. Magnetic resonance (MR) imaging studies for voxel-based morphometry were performed on 43 of the 48 subjects who underwent SPECT study. All SPECT, PET, and MR images were transformed into the standard brain format with the SPM2 system. The voxel values of each SPECT and PET image were globally normalized to 50 ml/100 ml/min. Gray matter, white matter, and cerebrospinal fluid images were segmented and extracted from all transformed MR images by applying voxel-based morphometry methods with the SPM2 system. **Results:** Regional distribution of all three SPECT tracers differed from that of H₂¹⁵O in the pons, midbrain, thalamus, putamen, parahippocampal gyrus, posterior cingulate gyrus, temporal cortex, and occipital cortex. No significant correlations were observed between the tissue fraction of gray matter and CBF with any tracer. **Conclusion:** Differences in regional distribution of SPECT tracers were considered to be caused mainly by differences in the mechanism of retention of tracers in the brain. Regional distribution of CBF was independent of regional distribution of gray matter fractions, and consequently the blood flow per gray matter volume differed for each brain region.

Key words: SPECT, CBF, I-123-IMP, Tc-99m-HMPAO, Tc-99m-ECD