ORIGINAL ARTICLE

Annals of Nuclear Medicine Vol. 16, No. 2, 127–135, 2002

A simplified double-injection method to quantify cerebral blood flow and vascular reserve using iodine-123 IMP-SPECT

Hiroshi TOYODA,* Sadahiko NISHIZAWA,*,** Toshiki SHIOZAKI,*
Makoto UENO* and Junji KONISHI*

*Department of Nuclear Medicine and Diagnostic Imaging, Graduate School of Medicine, Kyoto University
**Biomedical Imaging Research Center, Fukui Medical University

We developed and evaluated a simplified double-injection method for iodine-123 *N*-isopropyl-*p*-iodoamphetamine (IMP) to quantify regional cerebral blood flow (rCBF) twice in a single SPECT session. The method enabled rapid calculations of rCBF with five 10-minute SPECT scans, a fixed distribution volume (V_d), and one-point arterial blood sampling to calibrate a standard input function (SIF). ***Methods:*** Sixty neurological patients were examined to measure rCBF twice in a single session of IMP-SPECT. Patients underwent frequent arterial blood sampling with two injections of IMP and acetazolamide challenge. We generated the SIF and determined the optimal V_d and calibration time (t_{cal}) for the SIF in 30 patients. Validities of the fixed t_{cal} and V_d were assessed in the remaining 30 patients. Simulation studies were also performed to evaluate the error sensitivity of the method. ***Results:*** The optimal t_{cal} and V_d were 34 min and 30 m*l*/m*l*, respectively. The method was robust in rCBF calculation with noisy SPECT data and yielded rCBF with negligible bias and acceptable errors compared with those obtained by the double-injection method previously reported. ***Conclusion:*** The method can be applied to measure rCBF twice in a single SPECT session more easily and less invasively.

Key words: iodine-123-IMP, regional cerebral blood flow, SPECT, cerebrovascular reserve capacity