Summary

Validation and Optimization of the Use of Standardized Arterial Input Function in N-Isopropyl-p[^{123}I]Iodoamphetamine Cerebral Blood Flow SPECT

Toshiyuki OGURA*, Syugo TAKIKAWA**, Hisatoshi SAITO**, Mayumi NAKAZAWA***, Miho SHIDAHARA**** and Hidehiro IIDA*****

**Department of Radiology, Sapporo Azabu Neurosurgical Hospital*
***Department of Neurosurgery, Sapporo Azabu Neurosurgical Hospital*
****Nihon Medi-Physics Co., Ltd.*
*****Akita Research Institute of Brain and Blood Vessels*

Use of a standardized arterial input function and calibrating it by a single blood sample has been proposed to assess quantitatively cerebral blood flow using N-isopropyl-p[^{123}I]iodoamphetamine (IMP) and single-photon emission computed tomography. This study was intended to validate this approach using a larger number of measured arterial radioactivity curves in the clinical setting. Method: Arterial input function was measured for 50 patients at rest following the i.v. IMP, and its inter-subject variation was assessed. Difference between smokers and non-smokers in addition to effects of acetazolamide administration were particularly investigated. We also evaluated the accuracy of the calibration procedures by means of either a single blood sample or a continuous arterial blood withdrawal sampling for an early period. Results: Inter-subject variation of the observed arterial input function appeared not to show large variations among the 50 patients, thus suggesting the validity of using the standardized arterial input function for the IMP SPECT study. There was a significant difference in the shape of the arterial input function between the smokers and non-smokers, but the calibration at an optimized sampling time provided the area-under-the curve (AUC) that was not significantly different between the two groups. The arterial input function after the acetazolamide showed no significant difference as compared with the shape at rest. The calibration of the standardized input function by means of the early integration of individual curve did not show better accuracy except for a short period of AUC (i.e., $<$20 min) for longer integration period $>$10 min. Conclusion: Thus, use of the standardized arterial input function has been validated for the IMP SPECT study. The single blood sampling procedure for calibrating the standardized input function has also been validated, and has been shown to provide better accuracy compared with the continuous withdrawal procedure.

Key words: N-isopropyl-p[^{123}I]iodoamphetamine, Single photon emission computed tomography, Cerebral blood flow, Arterial input function.