ORIGINAL ARTICLE

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Quantifying regional cerebral blood flow with N-isopropyl-p[^{123}I]iodoamphetamine by ring-type single-photon emission computed tomography: Validity of a method to estimate early reference value by means of regional brain time-activity curve

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A more accurate quantitative method for the measurement of regional cerebral blood flow (rCBF) with the microsphere model and N-isopropyl-p-[^{123}I]iodoamphetamine (^{123}I-IMP) and ring-type single-photon emission computed tomography (SPECT) was developed. Continuous withdrawal of arterial blood was carried out for 5 minutes after the injection. Static SPECT data were acquired from 25 min to 55 min. To estimate reconstructed images at 5 min, total brain count collections and one minute SPECT studies were performed at 5, 20, and 60 min. Quantitative values for rCBF were calculated from short time SPECT images at 5 min (rCBF), static SPECT images corrected by total brain counts ($rCBF_{Ct}$) and those corrected by reconstructed counts on short time SPECT images ($rCBF_{Cb}$). Practically, $rCBF_{Cb}$ is calculated by using reconstructed counts of regions of interest placed in the same position as static SPECT and short time SPECT at 5, 20, 60 min. Although there was good correlation between rCBF and $rCBF_{Ct}$ ($r = 0.69$), $rCBF_{Ct}$ tended to be underestimated in high flow areas and overestimated in low flow areas. A better correlation was observed between rCBF and $rCBF_{Cb}$ ($r = 0.92$). The overestimation and underestimation observed in $rCBF_{Ct}$ was considered to be due to the correction method with a total cerebral time activity curve, because the kinetic behavior of ^{123}I-IMP was different in each region.

Key words: ^{123}I-IMP, single photon emission computed tomography, rCBF measurement, microsphere model, distribution volume