

Error analysis of autoradiography method for measurement of cerebral blood flow by ^{123}I -IMP brain SPECT: A comparison study with table look-up method and microsphere model method

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N-isopropyl-p-[^{123}I]iodoamphetamine (IMP) has been commonly used as a cerebral blood flow tracer, but, significant clearance of IMP from the brain to the blood causes underestimation of cerebral blood flow (CBF) as compared with true CBF when the conventional microsphere model method is applied. Previously, we reported an "Autoradiography method" (ARG method) for measuring CBF by using IMP in which this clearance effect was corrected. This method was based on a two-compartment model (influx: K_1 , efflux: k_2 , K_1/k_2 = distribution volume of IMP (V_d)), the K_1 (corresponding to CBF) being obtained from the table which showed a correlation between CBF and the brain counts of SPECT scan with a constant V_d value. Arterial input data used were obtained by one point blood sampling 10 min after IMP infusion against the standard input function. In the present study, the ARG method was compared with the table look-up method (TLU method) and the conventional microsphere model method (MS method) for 30 subjects. When the V_d value in the ARG method was assumed to be 50 ml/ml, CBF values obtained by the ARG method were correlated well with those obtained by the TLU method ($Y = 1.04X - 2.5$; X: TLU, Y: ARG, $r = 0.97$) and those obtained by the MS method ($Y = 0.82X + 12.1$; X: ARG, Y: MS, $r = 0.84$). But, when the V_d value was assumed to be more or less than 50 ml/ml, ARG method CBF were under- or overestimated compared with the TLU method. This indicated that the ARG method could be a reliable method for CBF measurement if the V_d was determined properly. CBF values obtained by the MS method were actually 13.2% higher than those obtained by the ARG method against previous studies. As reasons for this, errors in the effects of gray-white matter mixture in the ARG method and in estimation of the SPECT brain counts at 8 min in the MS method were considered.

Key words: IMP, SPECT, cerebral blood flow, autoradiography method