

Error analysis of measured cerebral vascular response to acetazolamide stress by I-123-IMP autoradiographic method with single photon emission computed tomography: Errors due to distribution volume of I-123-IMP

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Objectives: Iodine-123 (^{123}I)-labeled *N*-isopropyl-*p*-iodoamphetamine (IMP) has been used as a cerebral blood flow (CBF) tracer for single-photon emission computed tomography (SPECT), and measurements of the CBF response to acetazolamide stress by SPECT with IMP are widely used to assess cerebral vascular reserve. To quantitate CBF by means of SPECT with IMP, an autoradiographic (ARG) method has been developed and is widely used. In the ARG method, CBF is calculated from the brain counts of the SPECT scan with an assumed distribution volume value of IMP (V_d). However, differences between true V_d and assumed V_d results in errors in calculated CBF. In the present study, errors in the CBF response to acetazolamide stress as calculated by the ARG method were investigated. **Methods:** SPECT studies were performed on 12 patients with steno-occlusive lesions of the major cerebral artery. Two studies were performed on separate days. The first study was performed at rest (baseline), and the second during acetazolamide stress. SPECT scans were performed at 40 min (early scan) and 180 min (delayed scan) after intravenous injection of IMP. **Results:** Although a simulation study showed that errors in calculated changes in CBF in response to acetazolamide stress, which result from differences between the true V_d and the assumed V_d , were larger when the baseline CBF and change in CBF were larger, values calculated by the ARG method with an assumed V_d were in good agreement with those calculated with true V_d obtained from early and delayed scan data. **Conclusion:** These data indicate that errors in the calculated CBF response to acetazolamide stress as calculated by the ARG method are negligible even at high CBF responses. The ARG method is therefore reliable for measurement of CBF response to acetazolamide stress.

Key words: IMP, SPECT, acetazolamide, cerebral vascular reserve, ARG method