

Database of normal human cerebral blood flow measured by SPECT: II. Quantification of I-123-IMP studies with ARG method and effects of partial volume correction

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The limited spatial resolution of SPECT causes a partial volume effect (PVE) and can lead to the significant underestimation of regional tracer concentration in the small structures surrounded by a low tracer concentration, such as the cortical gray matter of an atrophied brain. The aim of the present study was to determine, using ^{123}I -IMP and SPECT, normal CBF of elderly subjects with and without PVE correction (PVC), and to determine regional differences in the effect of PVC and their association with the regional tissue fraction of the brain. **Methods:** Quantitative CBF SPECT using ^{123}I -IMP was performed in 33 healthy elderly subjects (18 males, 15 females, 54–74 years old) using the autoradiographic method. We corrected CBF for PVE using segmented MR images, and analyzed quantitative CBF and regional differences in the effect of PVC using tissue fractions of gray matter (GM) and white matter (WM) in regions of interest (ROIs) placed on the cortical and subcortical GM regions and deep WM regions. **Results:** The mean CBF in GM-ROIs were 31.7 ± 6.6 and 41.0 ± 8.1 ml/100 g/min for males and females, and in WM-ROIs, 18.2 ± 0.7 and 22.9 ± 0.8 ml/100 g/min for males and females, respectively. The mean CBF in GM-ROIs after PVC were 50.9 ± 12.8 and 65.8 ± 16.1 ml/100 g/min for males and females, respectively. There were statistically significant differences in the effect of PVC among ROIs, but not between genders. The effect of PVC was small in the cerebellum and parahippocampal gyrus, and it was large in the superior frontal gyrus, superior parietal lobule and precentral gyrus. **Conclusion:** Quantitative CBF in GM recovered significantly, but did not reach values as high as those obtained by invasive methods or in the H_2^{15}O PET study that used PVC. There were significant regional differences in the effect of PVC, which were considered to result from regional differences in GM tissue fraction, which is more reduced in the frontoparietal regions in the atrophied brain of the elderly.

Key words: ^{123}I -IMP, quantitative SPECT, cerebral blood flow, partial volume effect, tissue fraction