

Apparent CBF decrease with normal aging due to partial volume effects: MR-based partial volume correction on CBF SPECT

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Several studies using single photon emission tomography (SPECT) have shown changes in cerebral blood flow (CBF) with age, which were associated with partial volume effects by some authors. Some studies have also demonstrated gender-related differences in CBF. The present study aimed to examine age and gender effects on CBF SPECT images obtained using the ^{99m}Tc -ethyl cysteinyl dimer and a SPECT scanner, before and after partial volume correction (PVC) using magnetic resonance (MR) imaging. Forty-four healthy subjects (29 males and 15 females; age range, 27–64 y; mean age, 50.0 ± 9.8 y) participated. Each MR image was segmented to yield grey and white matter images and coregistered to a corresponding SPECT image, followed by convolution to approximate the SPECT spatial resolution. PVC-SPECT images were produced using the convoluted grey matter MR (GM-MR) and white matter MR images. The age and gender effects were assessed using SPM99. Decreases with age were detected in the anterolateral prefrontal cortex and in areas along the lateral sulcus and the lateral ventricle, bilaterally, in the GM-MR images and the SPECT images. In the PVC-SPECT images, decreases in CBF in the lateral prefrontal cortex lost their statistical significance. Decreases in CBF with age found along the lateral sulcus and the lateral ventricle, on the other hand, remained statistically significant, but observation of the spatially normalized MR images suggests that these findings are associated with the dilatation of the lateral sulcus and lateral ventricle, which was not completely compensated for by the spatial normalization procedure. Our present study demonstrated that age effects on CBF in healthy subjects could reflect morphological differences with age in grey matter.

Key words: SPECT, partial volume effects, age, brain atrophy, MRI