Cerebral Blood Flow Change in Late-life Depression: An ASL MRI Study.

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Introduction

Depression is a common disease for the elderly and may cause severe consequences (1). Cerebral blood flow (CBF) was related to the refractoriness and chronification which were regarded as predictors in prognosis of late-life depression (LLD) (2). Previous studies had used SPECT and PET for evaluation CBF in depression cohort, but inconsistent results were observed (2, 3). A recent study used pulsed ASL to investigate the perfusion in LLD but only found that white matter had lower CBF in the depressed group as compared with normal elderly (4). Due to the fact that the elderly tend to have low CBF, thus higher signal-to-noise ratio (SNR) for perfusion image is necessary. Pseudo-continuous arterial spin labeling (PCASL) MRI performed an absolutely CBF quantification with high SNR. In addition, PCASL with 3D-FSE acquisition is not sensitive to susceptibility artifacts in areas known to be relevant to LLD, such as the orbital frontal gyrus. This study aimed to obtain perfusion image by 3D-FSE PCASL and to investigate whole-brain CBF difference using voxelwise analysis in the LLD.

Methods

Subjects: A total of twenty-one LLD patients (8 male, 13 female; age: 67.0±5.5y) and seventeen age-matched elder controls (6 male, 11 female; age: 67.5±4.9y) participated in this study. Subjects with dementia, neurovascular disease and history of brain injury were excluded. ***MRI:*** Perfusion images were acquired on a 3T clinical MRI scanner using a 3D-FSE background suppressed PCASL sequence (TR/TE/FA = 4574ms/10.14ms/111°, labeling duration = 1500ms, Pulse labeling delay = 1525ms, in-plane matrix = 128 × 128, slice thickness = 5mm). 32 slices per volume was obtained for each subjects. ***Data Analysis:*** ASL data preprocessing included spatially normalized to the MNI template and smoothed with an 8-mm Gaussian kernel. Voxelwise analysis was performed using statistical parametric mapping (SPM8) software (www.fil.ion.ucl.ac.uk/spm). Coordinates of the significant areas were converted into Talairach space using GingerALE 2.3.1 (http://www.brainmap.org/ale/).

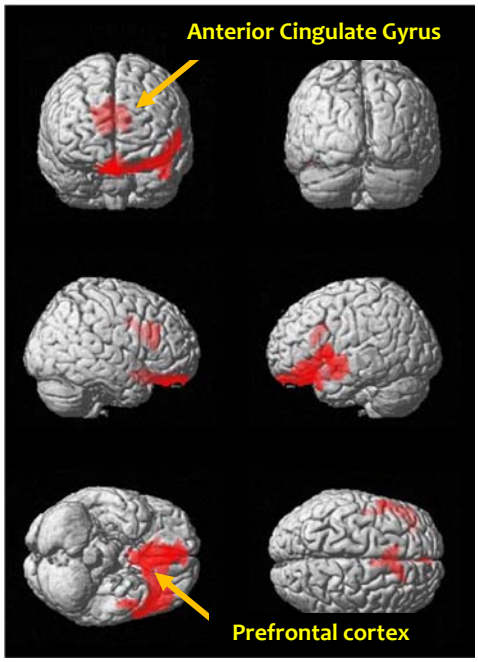

Fig. 1

Results

Significantly (P<.01, corrected) lower CBF in LLD cohort was found in the medial prefrontal areas, including left rectal gyrus (Brodmann Area, BA 11), left medial frontal gyrus (BA 25) and left subcallosal gyrus (BA 25), and in the anterior cingulate gyrus (BA 24, 32) (Figure 1). No significant CBF increase was observed in the LLD patients.

Discussion

The regions of significant difference in CBF were identical to the previous studies that hypoperfusion was observed in prefrontal cortex and anterior cingulate cortex (2). The regions of hypoperfusion in the medial prefrontal areas were considered as the primary atrophy regions in the depressed subjects. The correlations between differences in perfusion and anatomical volumes of these areas require further investigations.

Conclusion

PCASL played a potent role in discriminating CBF difference between LLD and elder controls. To evaluate whether PCASL CBF map could perform as a clinical biomarker in the LLD symptoms, further studies will analyze the correlation with clinical test scores.

References

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