The baseline and longitudinal changes of PCC connectivity in mild cognitive impairment: a combined structure and resting-state fMRI study

zhiqun wang[1], and kuncheng li[1]

[1]*Radiology, XuanWu Hospital, Beijing, Beijing, China, People's Republic of*

Background: A growing amount of evidence confirmed that mild cognitive impairment (MCI) presented a neuro-disconnection syndrome. Some resting-state fMRI studies investigated the posterior cingulate cortex (PCC) related network changes in MCI patients. However, the longitudinal study of resting fMRI in MCI is extremely limited and there remains urgency to identify the patterns of altered function in MCI.

Objective: We aimed to use resting state functional MRI (fMRI) to examine baseline and longitudinal changes in PCC connectivity in MCI patients.

Materials and Methods: Twenty-eight right-handed subjects (14 MCI patients and 14 healthy elders) participated in this study. Clinical and neuropsychological examinations were performed on all the subjects. Resting state Functional MRI data was collected by using an echo-planar imaging (EPI) sequence on 3T MRI. All analyses were conducted using a statistical parametric mapping software package (SPM5, http://www.fil.ion.ucl.ac.uk/spm). The PCC region of interest (ROI) was generated using the free software of WFU_PickAtlas Tool Version 2.4 (http://www.ansir.wfubmc.edu). PCC functional connectivity was investigated by examination of the correlation between low frequency fMRI signal fluctuations in the PCC and those in all the other brain regions. We examined the gray matter atrophy in MCI patients and use it as covariate to analyze the resting functional connectivity. Additionally, we traced the MCI patients and compared the PCC connectivity in initial stage and 3 years later stage. We also investigate the relationship between the PCC functional connectivity strength and cognitive performances.

Results: Functional connectivity between the PCC and a set of regions was decreased in MCI patients. Most of these regions are within the default mode network (DMN). After 3 years, the regions of superior frontal gyrus (SFG) and middle frontal gyrus (MFG) presented further decreased connectivity to the PCC in MCI. In addition, we also found enhanced functional connectivity between the PCC and medial prefrontal cortex (MPFC), PCC and anterior cingulate cortex (ACC) in MCI patients. At last, the strength of the PCC functional connectivity is independent of the gray matter atrophy of the MCI patients, and it is closely correlated to some neuropsychological scores

Conclusion: The baseline and longitudinal changes of the PCC connectivity suggest that impairment and compensation coexist in MCI patients.

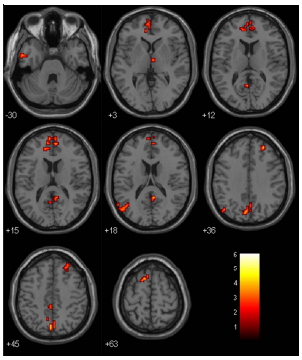

Fig.1

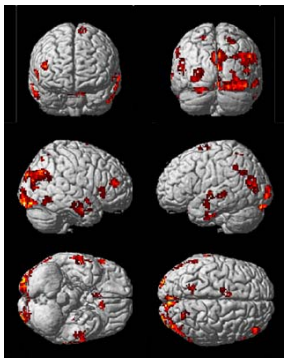

Fig.2

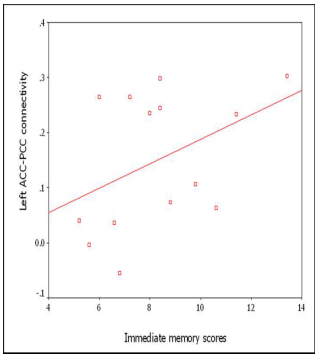

Fig.3

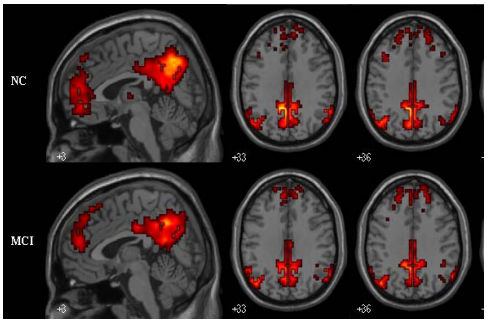

Fig.4

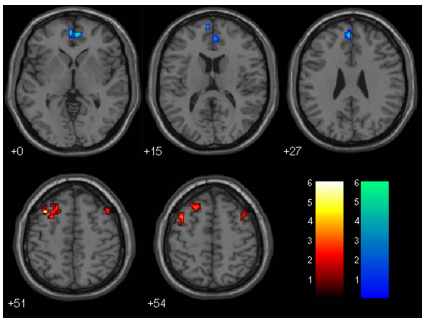

Fig.5

Fig.1 Brain regions showing decreased connectivity to PCC in MCI group comparing to control group. Left in picture is left in the brain. The color scale represents t values. **Fig.2** Brain regions showing gray matter atrophy in MCI group comparing to controls. **Fig.3** Correlation between left ACC-PCC connectivity and immediate memory scores ($r=0.42$, $p<0.05$) **Fig.4** Brain regions showing significant connectivity to PCC within controls and MCI. Left in picture is left in the brain **Fig.5** Brain regions showing decreased and increased connectivity to PCC in MCI group 3 years later: warm color represents decreased connectivity, while cool color represents increased connectivity. Left in picture is left in the brain. The color scale represents t values.