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Resting-state functional magnetic resonance imaging in patients with leukoaraiosis-associated subcortical vascular cognitive impairment: a cross-sectional study

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Objectives: The aim of the study was to investigate the difference of resting-state default-mode network (DMN) between patients with leukoaraiosis (LA)-associated subcortical vascular cognitive impairment (SVCI) and control subjects, and to provide functional imaging evidence of SVCI.

Methods: All subjects (n = 58) were divided into two groups based on their clinical diagnosis: a LA-associated SVCI group (n = 31, 14 males) and a control group (n = 27, 14 males). Demographic information and resting-state functional MRI (rs-fMRI) data were obtained. These subjects were assessed using the Hamilton Anxiety Depression Scale, Clinical Dementia Rating, Mini Mental State Exam, and Montreal Cognitive Assessment. Experimental data and confounding factors were described with a General Liner Model. Independent components of fMRI data were analyzed with an fMRI toolbox.

Results: The active areas involved in DMN of LA-associated SVCI group were similar to those of the control group. However, several active areas of LA-associated SVCI group, especially the left anterior cingulate cortex and the right parahippocampal gyrus, showed signi cantly lower blood oxygen level-dependent (BOLD) signals compared with the control group ($p < 0.05$); whereas the left caudate nucleus ($p = 0.015$), the right frontal lobe ($p = 0.004$), and the superior temporal gyrus/inferior parietal gyrus ($p = 0.001$) exhibited signi cantly higher BOLD signals compared with the control group.

Discussion: The present study provides neuroimaging evidence for the recognition of LA-associated SVCI. Moreover, the differences in the functional alterations of the resting-state DMN might be a distinguishing feature between SVCI and amnestic mild cognitive impairment patients.

Keywords: Subcortical vascular cognitive impairment, Leukoaraiosis, Default-mode network, Dementia

Introduction

Leukoaraiosis (LA) is a radiological term that was created by Hachinski in 1987[1]. Patients with LA show mottled or patchy changes in the periventricular or subcortical white matter on MRI. LA can be found in patients with Alzheimer's disease (AD), Binswanger's disease, vascular cognitive impairment, and carbon monoxide poisoned patients, as well as in a subset of normal elderly people. The morbidity of LA in the elderly people varies from 50 to 98%[2]. This wide range can be attributed to differences in the age of the populations being examined and to the imaging techniques applied to them. Cognitive impairment, the most common clinical feature associated with LA, manifests in memory loss, lack of attention, slow thinking process, and executive function impairment[3,4]. Radiological studies have shown that normal elderly people with LA are at risk of further cognitive deterioration[5]. The magnitude of LA is positively correlated with the severity of

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