Abnormal intrinsic brain activity patterns in leukoaraiosis patients with cognitive impairment: A resting state fMRI study

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Objective: To explore the amplitude of the low-frequency fluctuations(ALFF) of whole brain in leukoaraiosis patients with cognitive impairment.

Methods: We utilized resting-state functional magnetic resonance imaging (R-fMRI) to measure the amplitude of low-frequency fluctuations (ALFF) in 28 LA patients with vascular mild cognitive impairment (LA-VaMCI), 18 LA with vascular dementia(LA-VaD) and 28 age- and sex-matched healthy controls.All subjects were instructed to complete a comprehensive neuropsychological battery tests and resting fMRI scan. ALFF was calculated using REST software.The relationship between the ALFF results and cognitive parameters in each group were also evaluated.

Results: There were widespread differences in ALFF in many brain regions, predominantly including the right inferior temporal gyrus(ITG) and posterior cingulate cortex (PCC). Compared to controls, the LA-VaD patients had decreased ALFF values in the PCC and increased ALFF values mainly in temporal regions. The LA-VaMCI patients had increased ALFF values mainly in ITG. Finally, Close correlations were found between the ALFF values of Pcu and the memory test scores of LA-VAD patients.

Conclusions: Our study suggests that in leukoaraiosis patients have widespread abnormalities in intrinsic brain activity, which might further affect cognitive performance.

Characteristics and neuropsychological test of the subjects:

Variable	NC (n=23)	WMLs-VCIND (n=22)	WMLs-VaD (n=23)	Statistic	P-value
Age,years	55.34±10.07	63.14±7.36	65.35±8.82	8.09	0.001
Woman,n(%)	11(47.83%)	10(45.45%)	7(30.43%)	1.682	0.431
Education,n(%)					
Primary	0	1（4.54%）	3(13.04%)	1.682	0.431
Secondary	12(52.17%)	14（63.64%）	16(69.56%)		
Superior	11(47.83%)	7（31.82%）	4(17.40%)		
Hypertion, n(%)	9(39.13%)	6(27.27%)	14(60.87%)	5.265	0.068
Smoking, n(%)	6	5	4	0.514	0.773
Diabetes, n(%)	4	2	5	1.364	0.505
Cholesterol, n(%)	5	3	6	1.094	0.579
Body mass index	23.87±1.18	24.27±1.12	24.13±1.01	0.772	0.466
MMSE	28.91±1.31	25.54±1.84	22.04±1.99	89.89	0.000
MoCA	27.65±1.49	22.23±1.45	17.39±2.92	140.407	0.000

Regions showing ALFF differences among the three groups.

ROIs	Regions	Number of voxels	Peak F	MNI coordinate(mm) x	y	z
1	Right ITG	797	9.39	42	-9	-42
Increesed ALFF in LA						
2	Left PCu	207	8.33	-6	-45	24
Decereased ALFF in LA						

Brain regions showing ALFF differences
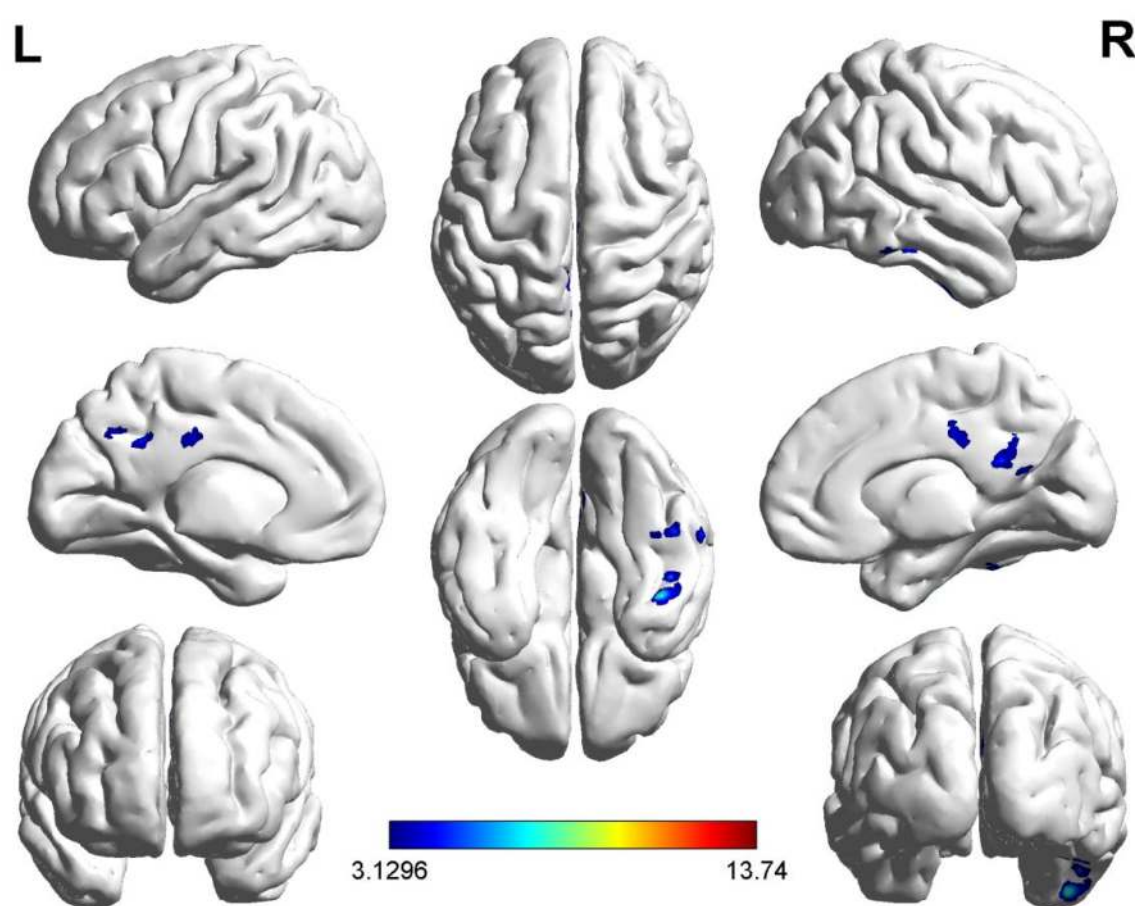
Color bars represent the t value of the group analysis.Cool color represents decreased ALFF values, and warm color represents increased ALFF values.

Brain regions showing ALFF differences
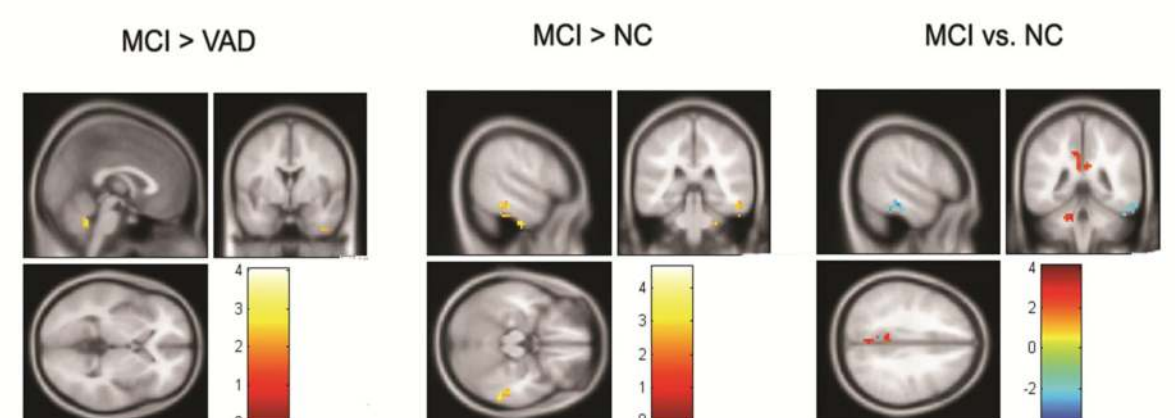
Correlations between ALFF values and cognitive performance

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