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·Letter to the Editor·

Reduced middle cingulate gyrus volume in late-onset schizophrenia in a Chinese Han population: a voxel-based structural MRI study

Dear Editor:

Numerous magnetic resonance imaging (MRI) studies have demonstrated that patients with early-onset schizophrenia (EOS) have widespread structural abnormalities in the cortical gray matter[1], suggesting that neurobiological processes play a central role in the structural abnormalities underlying the pathophysiology of schizophrenia[2]. In addition, volumetric abnormalities have been used to identify individuals at risk of mental states of psychosis by assessing patterns of individual whole-brain neuroanatomical abnormalities[3]. However, few studies have investigated the abnormalities of brain structure in late-onset schizophrenia (LOS, age at onset >40 years), a distinct subtype characterized by prominent hallucinations and delusions, using voxel-based morphometry (VBM) analysis[4]. However, to the best of our knowledge, there is no relevant report in the Chinese Han population. Thus, investigation of these abnormalities in LOS in this population could provide neuroanatomical clues for LOS. In the current study, we used VBM to analyze the gray matter volumes in Chinese Han patients with LOS and determined whether gray matter volume is associated with the psychotic symptoms, duration of illness, and medication dosage.

This study was approved by the Ethics Committee of the Second Xiangya Hospital of Central South University. The entire study design and procedures involved were in accordance with the Declaration of Helsinki. Risks and benefits of the study were presented in detail, and all participants gave written informed consent. Gray matter volume was measured in 20 patients with LOS and 17 well-matched healthy controls using VBM analysis (see supplementary material for Materials and Methods). Detailed demographics of patients with LOS and control subjects had been reported previously[5].

The VBM analysis showed a significantly lower volume of the middle cingulate gyrus in patients with LOS than in healthy controls (topological FDR corrected, P <0.05, Fig. 1, Supplementary Table 1). In contrast, no region in the gray matter was significantly higher in LOS patients. Previous MRI studies in patients with LOS primarily focused on particular brain areas using classical measurements based on regions of interest (ROIs), in addition to the ventricles, periventricular white matter, and subcortical nuclei[6]. VBM analysis is more sensitive than ROI analysis to structural changes of the whole brain. So, our VBM findings are more detailed and compatible with previous studies reporting cortical atrophy in patients with LOS[6]. However, our VBM findings were not consistent with a previous report from Japan[7]. This may be attributed to differences in the patients' age (range 40–58 years *vs* 41–73 years) and duration of illness (average duration 2.9 years *vs* 5.2 years)[7], as well as the anatomical variations in different ethnic

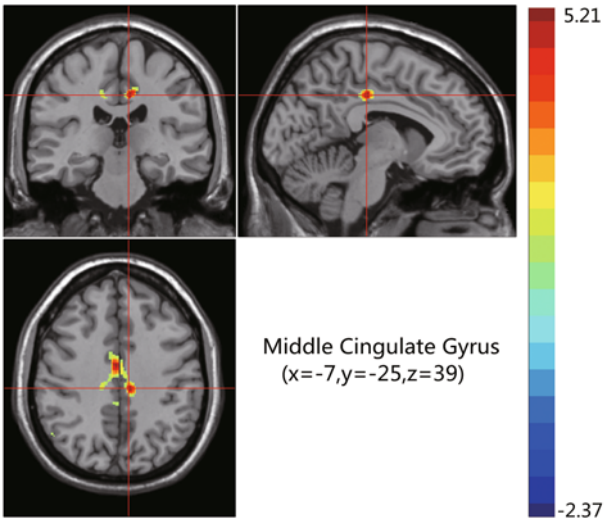

Fig. 1. Regions with lower gray matter volume in late-onset schizophrenia than in healthy controls (topological FDR corrected P <0.05). Late-onset schizophrenia patients, n = 20; healthy controls, n = 17.

populations[8]. Also, a lower cingulate volume has been reported in elderly patients with schizophrenia[9]. Abnormal levels of fractional anisotropy in the middle cingulum have been correlated with positive symptoms in antipsychotic-naive first-episode patients with schizophrenia[10]. Therefore, the middle cingulate gyrus may be the primary area affected in LOS and may play a crucial role in its pathology.

No correlation was found between the decrease in gray matter volume in the middle cingulate gyrus and the severity of psychiatric symptoms, illness duration, or antipsychotic dose (two-tailed, P <0.05). Therefore, the current findings suggest that changes in gray matter volume are evident in the typical population of patients with LOS, and volumetric deficits in the middle cingulate gyrus may indicate susceptibility to schizophrenia.

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REFERENCES

[1] Ellison-Wright I, Glahn DC, Laird AR, Thelen SM, Bullmore E. The anatomy of first-episode and chronic schizophrenia: an anatomical likelihood estimation meta-analysis. Am J Psychiatry 2008, 165: 1015–1023.

[2] Brent BK, Thermenos HW, Keshavan MS, Seidman LJ. Gray matter alterations in schizophrenia high-risk youth and early-onset schizophrenia: a review of structural MRI findings. Child Adolesc Psychiatr Clin N Am 2013, 22: 689–714.

[3] Koutsouleris N, Meisenzahl EM, Davatzikos C, Bottlender R, Frodl T, Scheuerecker J*, et al.* Use of neuroanatomical pattern classification to identify subjects in at-risk mental states of psychosis and predict disease transition. Arch Gen Psychiatry 2009, 66: 700–712.

[4] Vahia IV, Palmer BW, Depp C, Fellows I, Golshan S, Kraemer HC*, et al.* Is late-onset schizophrenia a subtype of schizophrenia? Acta Psychiatr Scand 2010, 122: 414–426.

[5] Chen L, Chen X, Liu W, Wang Q, Jiang T, Wang J*, et al.* White matter microstructural abnormalities in patients with late-onset schizophrenia identified by a voxel-based diffusion tensor imaging. Psychiatry Res 2013, 212: 201–207.

[6] Lesser IM, Miller BL, Swartz JR, Boone KB, Mehringer CM, Mena I. Brain imaging in late-life schizophrenia and related psychoses. Schizophr Bull 1993, 19: 773–782.

[7] Egashira K, Matsuo K, Mihara T, Nakano M, Nakashima M, Watanuki T*, et al.* Different and shared brain volume abnormalities in late- and early-onset schizophrenia. Neuropsychobiology 2014, 70: 142–151.

[8] Bai J, Abdul-Rahman MF, Rifkin-Graboi A, Chong YS, Kwek K, Saw SM*, et al.* Population differences in brain morphology and microstructure among Chinese, Malay, and Indian neonates. PLoS One 2012, 7: e47816.

[9] Frisoni GB, Prestia A, Adorni A, Rasser PE, Cotelli M, Soricelli A*, et al. In vivo* neuropathology of cortical changes in elderly persons with schizophrenia. Biol Psychiatry 2009, 66: 578–585.

[10] Cheung V, Chiu CP, Law CW, Cheung C, Hui CL, Chan KK*, et al.* Positive symptoms and white matter microstructure in never-medicated first episode schizophrenia. Psychol Med 2011, 41: 1709–1719.

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