

Magnetization Transfer Imaging of Suicidal Patients with Major Depressive Disorder

Ziqi Chen¹, Huawei Zhang¹, Zhiyun Jia^{1,2}, Jingjie Zhong³, Xiaoqi Huang¹, Mingying Du¹, Lizhou Chen¹, Weihong Kuang⁴, John A Sweeney⁵, and Qiyong Gong¹

¹Huaxi MR Research Center (HMRRC), Department of Radiology, West China Hospital of Sichuan University, Chengdu, Sichuan, China, ²Department of Nuclear Medicine, West China Hospital of Sichuan University, Chengdu, Sichuan, China, ³Department of Neurology, West China Hospital of Sichuan University, Chengdu, Sichuan, China, ⁴Department of Psychiatry, State Key Lab of Biotherapy, West China Hospital of Sichuan University, Chengdu, Sichuan, China, ⁵Departments of Psychiatry and Pediatrics, University of Texas Southwestern, Texas, United States

Purpose: There is an urgent clinical need to develop better understanding of the neurobiological substrates underlying suicidal behavior in major depressive disorder (MDD). Magnetization transfer imaging (MTI) provides a quantitative measure of macromolecular structural integrity of brain tissue, as represented by the magnetization transfer ratio (MTR). Thus, we utilized MTI to identify subtle biophysical alterations in MDD patients with and without a history of suicide attempts.

Methods: The participants were 36 medication-free adult patients with MDD, with (N = 17) and without (N = 19) a history of a suicide attempt, and 28 healthy controls matched for age, gender and ethnicity. Whole brain voxel-based analysis was used to compare MTR across the three groups and to analyze correlations with symptom severity and illness duration.

Results: MTR was decreased in the left inferior parietal lobule (IPL) and right superior parietal lobule (SPL) in suicide attempters (SA) relative to both non-attempters and controls. Non-attempters showed a reduced MTR in the left IPL and left cerebellum (posterior lobe) relative to controls (Figure 1, 2). These abnormalities were not correlated with symptom severity or illness duration.

Discussion: The IPL is involved in action organization and decision making when outcomes of behavioral choices are uncertain and these processes have been related to depression and suicidal behavior. Furthermore, parietal dysfunction in SA may lead to an impaired ability to redirect attention, which may predispose SA to persistent rumination and emotional states, causing them to take their lives based on a narrow view of their current life difficulties and coping options.

Conclusions: MTI identified subtle neuropathological abnormalities related to suicidal behaviors in depression in parietal cortex. Attentional dysfunction and impaired decision making secondary to parietal lobe abnormalities could increase risk for suicidal behavior in MDD. Studies working to directly link parietal lobe alterations with such neurobehavioral deficits in SA will bring us closer to understanding the pathophysiology of suicidal behavior.

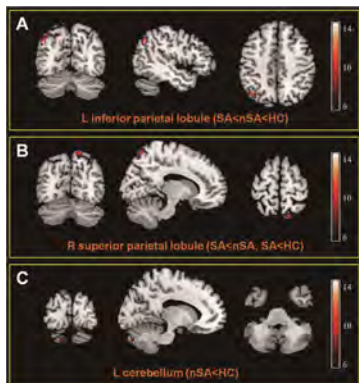


Figure 1. Magnetization transfer ratio differences in voxel-based analysis comparisons among major depressive disorder patients, with and without a history of suicide attempts, and healthy controls. $p < 0.05$ (corrected)

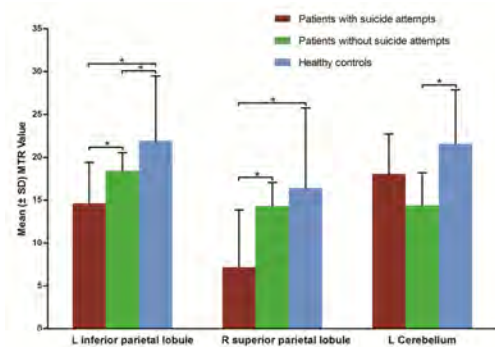


Figure 2. Magnetization transfer ratio in major depressive disorder patients with and without a history of suicide attempts, compared to healthy controls. * $p < 0.05$