

# Stereotypy in the psychiatric symptoms of catatonia

Sun Wei<sup>1</sup>, Huang Mingjin<sup>1</sup>, Huang Guoping<sup>1</sup>, Yao Xiaobo<sup>1</sup>, Zhang Guangyong<sup>1</sup>, Gao Li<sup>2</sup>, Wu Qiao<sup>1\*</sup>

<sup>1</sup>Department of Psychiatry, The Third Hospital of Mianyang, Sichuan Mental Health Center, Mianyang, Sichuan, China

<sup>2</sup>Department of Neurology, The Third Hospital of Chengdu, Chengdu, Sichuan, China

\*Corresponding author email: wuqiao@kmmu.edu.cn

**Abstract:** Catatonia is a severe, prevalent illness characterized by motor, emotional, behavioural and vegetative symptoms. The detection, diagnosis, and treatment of catatonia were investigated in this research using a middle-aged man patient with acute mental behaviour problem. According to the diagnosis and therapy, catatonia is hidden, which opens up new possibilities for future diagnosis and treatment.

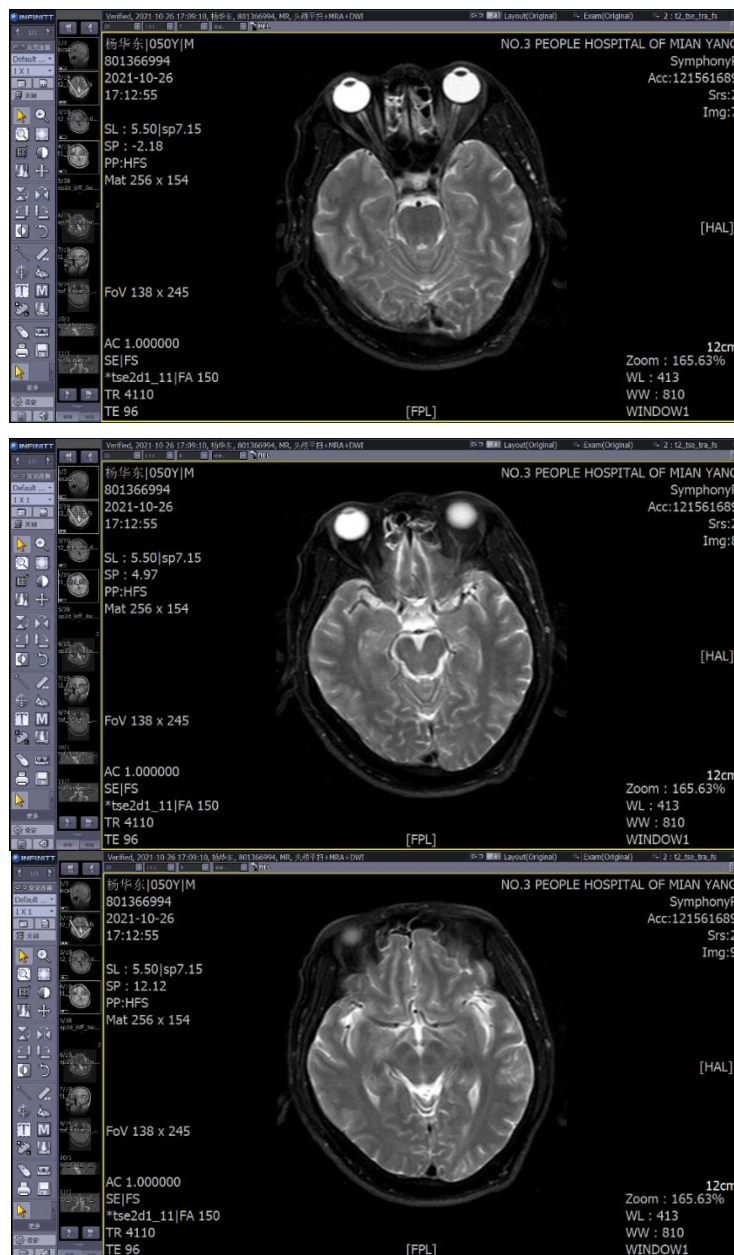
**Keywords:** Catatonia; Mental Disorders; Psychomotor Agitation; Emergency Services, Psychiatric

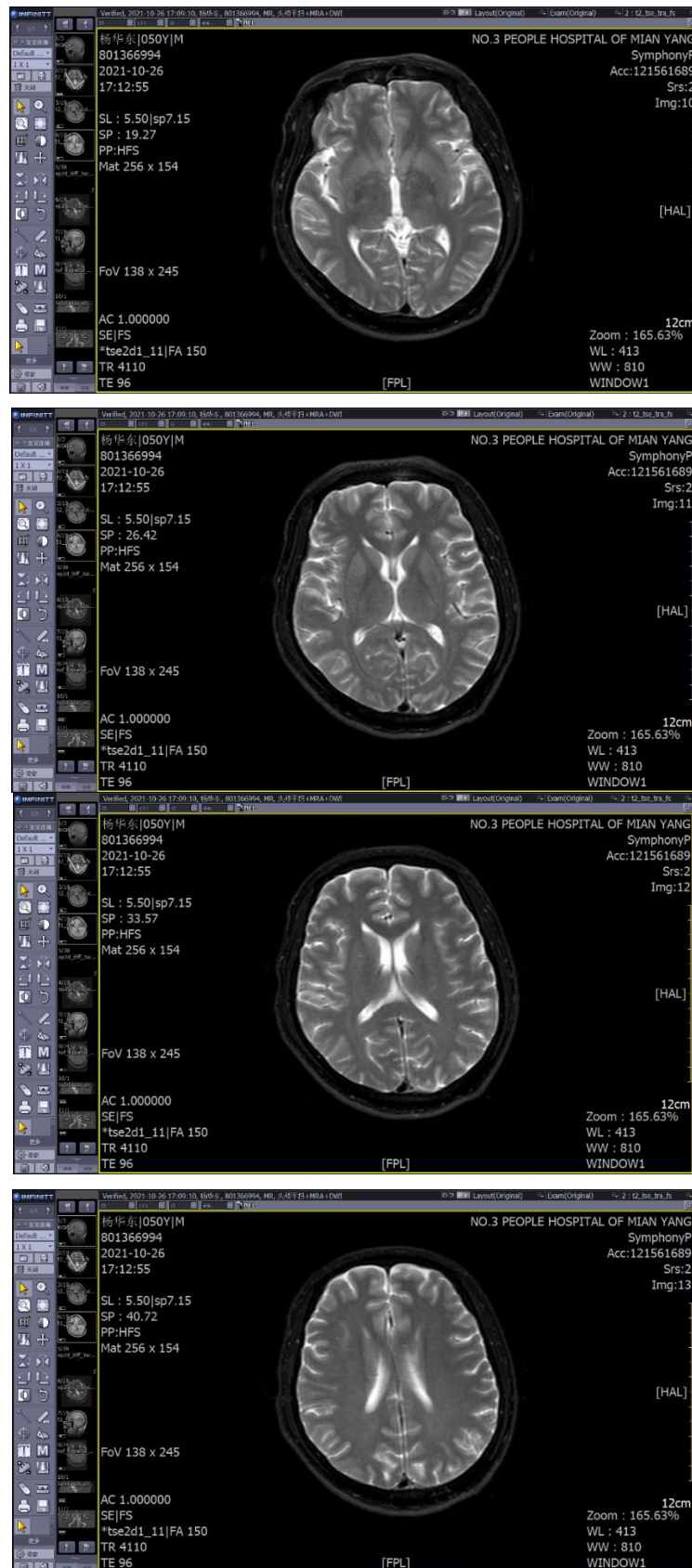
## 1. Case Data

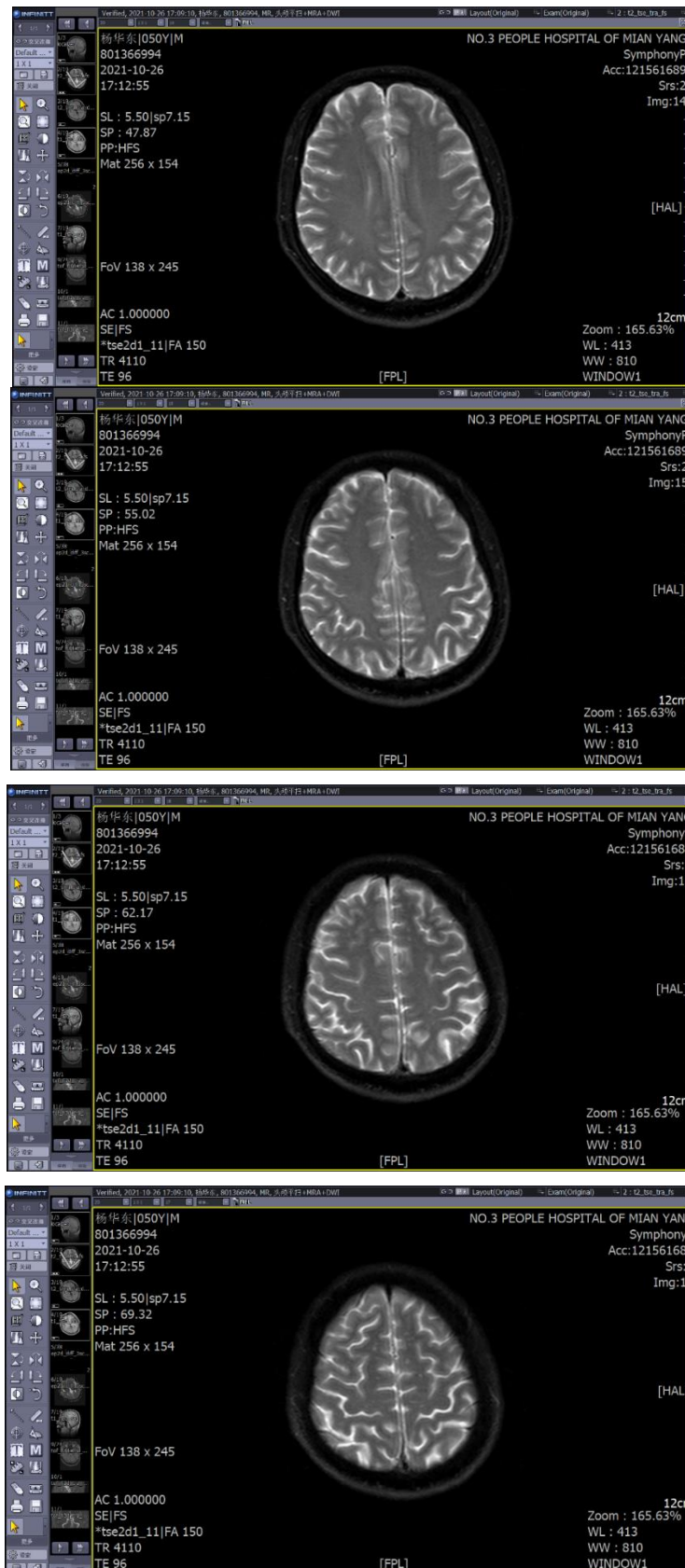
A 50-year-old male farmer was admitted to the Department of Neurology, the Third Hospital of Mianyang, Sichuan Mental Health Center on 25 October 2021 due to speech and behavioural abnormalities that had lasted for one day. Without apparent reason, the patient had talked in a rambling manner throughout the day, which was mainly manifested as meaningless words that the family members did not understand, and unresponsive to questions. Four hours before admission, the patient showed abnormal behaviour, consisting of taking off his clothes and rummaging around his house. The patient's previous history was unremarkable.

On admission, physical examination showed a body temperature of 37.1°C, pulse of 59 bpm, breathing rate of 16 bpm and blood pressure of 132/85 mmHg. There was no yellow staining on the skin and sclera and no palpable superficial lymph nodes of the whole body, no abnormality in the head and facial features, no swelling of thyroid glands, clear breathing sound of both lungs, and no rhonchus or moist rales. There was normal heart border, regular rhythm of the heart, no murmur in each valve area, flat and soft abdomen, no mass, and no tenderness and rebound pain in the whole abdomen. There was no palpable swelling of the liver and spleen, nor was there swelling visible in both lower limbs. Physical examination of the nervous system showed a normal level of consciousness, although the patient's sense of awareness was vague. The patient answered questions partially, was cooperative with the physical examination, but not cooperative with the advanced cortical function examination. Bilateral pupils of the patient were circular and equal in size (about 3 mm in diameter) and were sensitive to light reflection, with normal eye movements. The patient had symmetrical wrinkles on the forehead and bilateral nasolabial sulci, and displayed no tongue deviation. There was no abnormality in overall muscle volume and strength, and the muscle tension of four limbs, with symmetrical and active (+++) tendon reflexes, along with normal superficial and deep sensations. All of the results of the following tests were negative: finger-to-nose test, bilateral Babinski sign, Chaddock sign, Oppenheim sign and Gordon sign. The patient had a soft neck and also tested negative for the Kernig and Brudzinski signs. Psychiatric examination showed that the patient was excited, with paroxysmal irritability and difficulty in engaging in deep communication. The patient showed uncoordinated emotional response and lacked self-control. Among supplementary examinations, routine blood tests on 25 October 2021 showed a lymphocyte count (LYMPH#) of  $1.05 \times 10^9/L$ , lymphocyte percentage (LYMPH%) of 18.1% and a plateletcrit (PCT) of 0.14%. Kidney function test on 25 October 2021 showed a uric acid (URIC) level of 437  $\mu\text{mol/L}$ ; liver function test on 26 October 2021 showed total bilirubin, direct bilirubin (DBIL) and indirect bilirubin (TBIL) levels of 31.1  $\mu\text{mol/L}$ , 8.8  $\mu\text{mol/L}$  and 22.3  $\mu\text{mol/L}$ , respectively. The patient's electrocardiogram, blood gas analysis, glycosylated haemoglobin, infection markers, thyroid function, coagulation function, erythrocyte sedimentation rate, high-sensitivity C-reactive protein (hsCRP), myocardial enzymogram, electrolyte levels, cerebrospinal fluid biochemistry and general bacteriological culture were all normal after admission. The cerebrospinal fluid yielded a pressure of 140 mm H<sub>2</sub>O, and smears of the fluid

showed no evidence of *Cryptococcus neoformans*, fungi, *Mycobacterium tuberculosis*, and gram-negative or -positive bacteria. A head CT plain scan on 25 October 2021 showed normal brain parenchymal density with no space-occupying lesions; the ventricular system, sulcus and cistern all appeared normal; and there was no displacement in the brain midline structure. The skull showed no obvious abnormality, but with slight thickening of bilateral maxillary sinus and ethmoid sinus mucosa, suggesting a slight chronic inflammation. Meanwhile, head MRI, MRA and DWI on 26 October 2021 showed DWI signals that were slightly higher in the right occipital cortex, with slight increases in T2 and FLAIR signals; the sources of these signals were unknown; a few ischaemic foci were present in bilateral frontoparietal lobes. The scans showed no definite abnormalities in the ventricular system or in the scanned skull bone, with bilateral maxillary sinusitis, ethmoid sinusitis and hypertrophy of bilateral inferior nasal concha. Based on MRA, the arteries of the vertebral-basilar system, intracranial segments of the bilateral internal carotid, bilateral anterior cerebrum, middle cerebrum and posterior cerebrum all ran naturally and had smooth vessel walls; no definite signs of aneurysm, segmental stenosis, or abnormal vascular shadow were found. (figure 1)







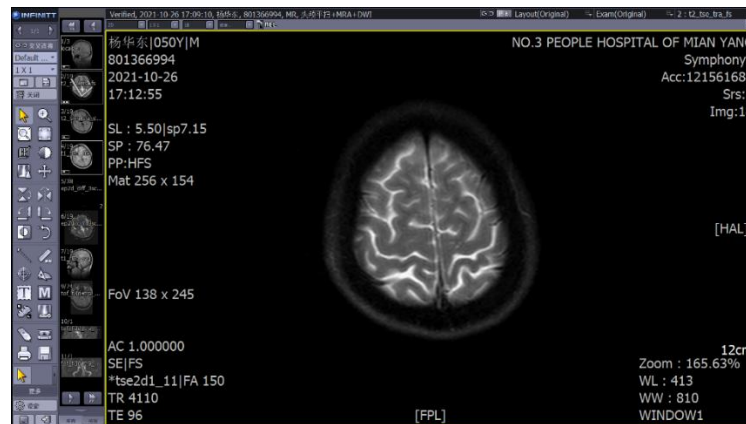


Figure 1 Brain MRI+MRA+DWI

The diagnostic tests on admission were unable to determine the exact causes of speech and behaviour abnormalities, with great possibility of viral encephalitis. Therefore, the patient was provided with an intravenous drip of 0.5 g Aciclovir every eight hours (an antiviral). In addition, 5 mg Olanzapine every night and 0.25 g magnesium valproate twice daily were administered orally to control the psychiatric symptoms; and 0.5 mg Mecobalamin orally three times daily and 100 mg Vitamin B1 were administered via intramuscular injection, respectively, for neurotrophic treatment. The patient responded poorly to these therapeutics. After 0.2 mg dexmedetomidine at a rate of 10 ml/h, the patient remained intermittently agitated and shouted his name repeatedly in response to any question. The patient was then transferred to the department of severe psychiatry for treatment.

Additional supplementary tests were administered. The liver function test on 28 October 2021 showed an aspartate transaminase level of 61U/L, a total protein level of 85.3 g/L, TBIL of 43.6  $\mu\text{mol/L}$ , DBIL of 13.3  $\mu\text{mol/L}$ , IBIL of 30.3  $\mu\text{mol/L}$  and a lactate dehydrogenase (LDH) level of 266 U/L. Further tests on 28 October 2021 showed levels of lipoprotein (a) at 404 mg/L, and homocysteine (Hcy) at 18  $\mu\text{mol/L}$ . Electrolyte tests on 28 October and hsCRP on 1 November 2021 showed levels of blood potassium at 3.37 mmol/L and hsCRP at 23.14 mg/L. A review of blood routine tests on 1 November 2021 showed a plateletcrit (PCT) level of 0.13%. Urinary microalbuminuria assay on 1 November 2021 showed a microalbuminuria (MA) level of 20.97 mg/L, with no abnormality detected during a review of the test the following day. Tests for tumour markers were conducted on 30 October 2021. The carbohydrate antigen (CA) 724 (21.91 U/ml), while carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), CA125, CA199, total prostate specific antigen, free prostate specific antigen (fPSA), neuron-specific enolase and cytokeratin (CY) 211 were normal. Repeated tests on thyroid function, procalcitonin (PCT), coagulation function, central nerve specific protein(S100- $\beta$ ) and electroencephalogram showed no abnormalities. Further CT plain scan of the whole abdomen on 1 November 2021 showed a slight low-density shadow in the left inner lobe of the liver, which was interpreted as a local fat infiltration; the full shape of the spleen was visible, along with thickening of the left adrenal gland and local nodular changes. A small stone was found in the right kidney. The scan also revealed a tortuous sigmoid colon, which, along with the rectum, was slightly dilated, with more visible content shadows. The lumbar spine had mild hyperosteoecy; and finally, a few inflammatory lesions with slight pleural effusion were visible on the dorsal side of the lower lobes of both lungs. A chest CT plain scan on 1 November 2021 showed inflammatory lesions or localised atelectasis in the lower lobes of both lungs, with bilateral pleural thickening, adhesion and a small amount of pleural effusion. The shape of the heart appeared full, with a small amount of pericardial effusion (figure 2).



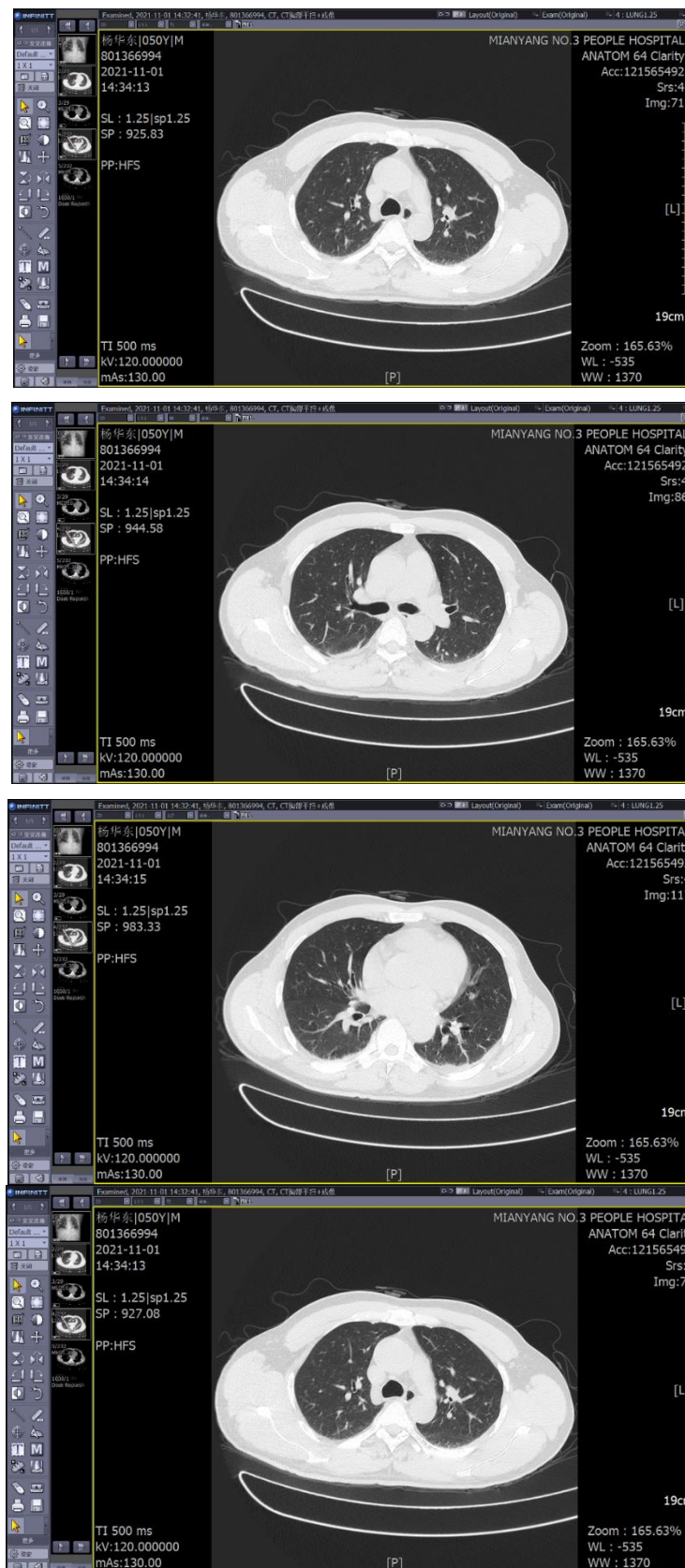


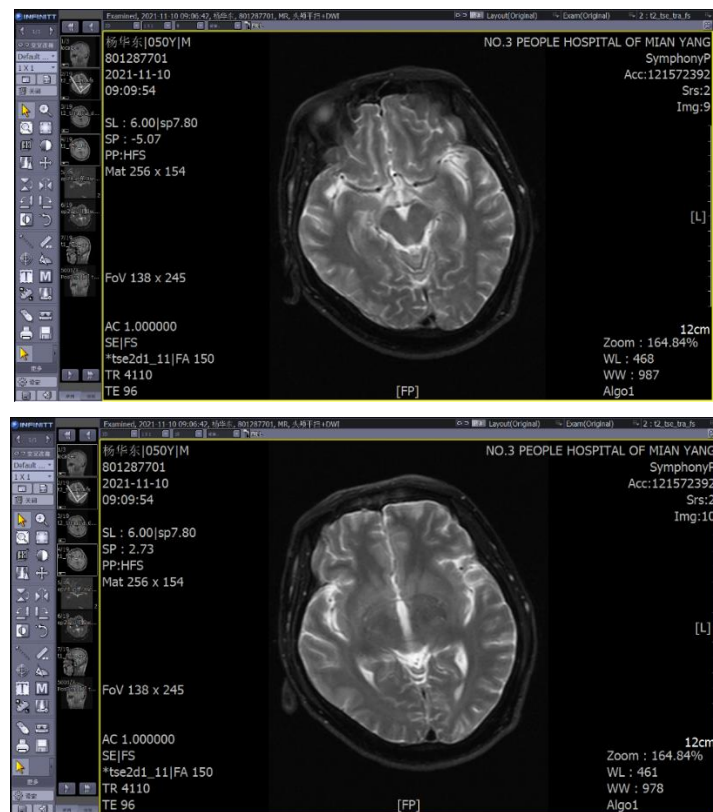
Figure 2 Chest CT

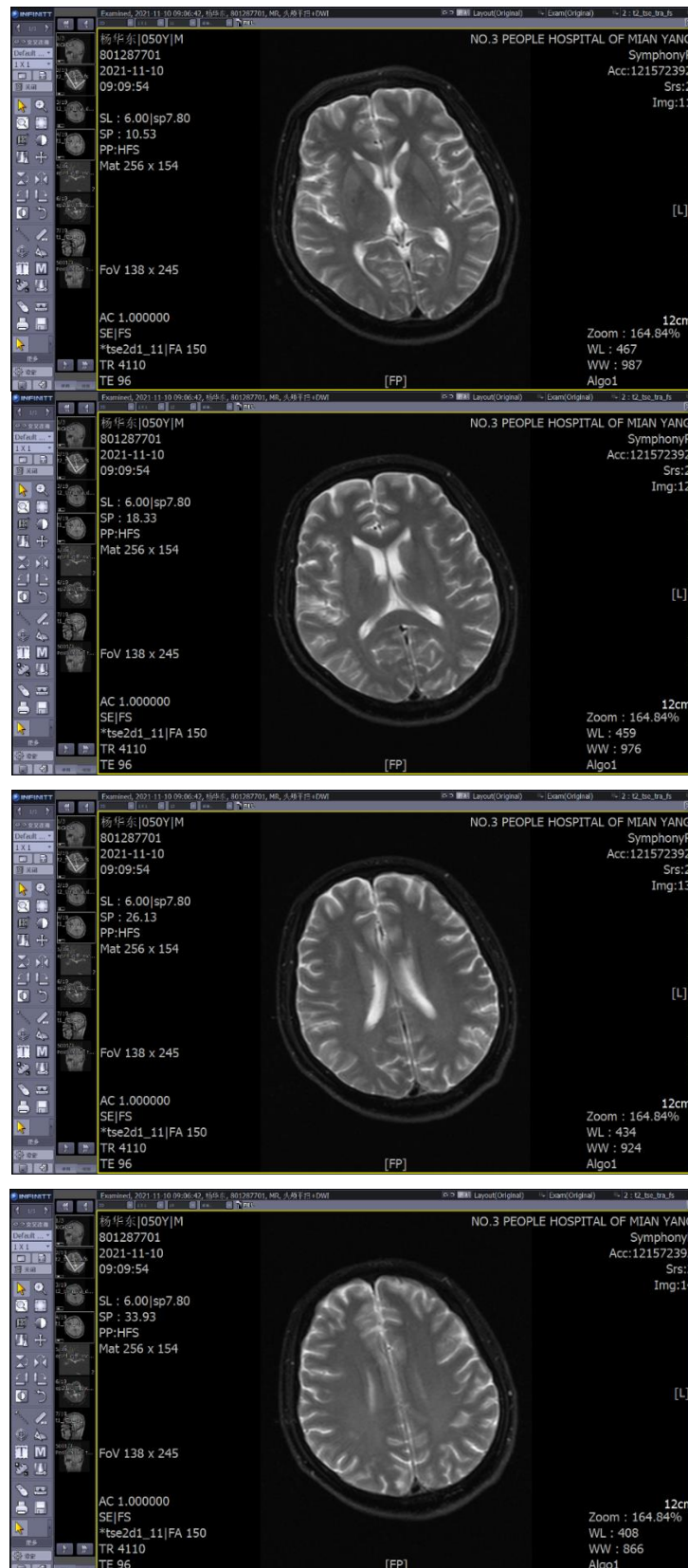
Tests conducted at the department of severe psychiatry indicated that the patient likely suffered from an organic mental disorder, and was thus administered with a continuous intravenous drip of 0.5 g Aciclovir every eight hours and 0.6g Aceglutamide once daily, and an injection of 100 mg Vitamin B1 once daily to treat neurotropy. The patient was also administered 6 mg Paliperidone once daily orally

to prevent psychotic symptoms and 0.25 g magnesium valproate orally twice daily to stabilise mood, along with suggestion and relaxation therapies and psychotherapy. After 5 days of the above treatment regimens, the patient remained excited, displayed disorderly behaviour and repeated the phrase 'the stars changing in position' continuously. The patient slept poorly at night, staying awake almost all night, making roaring sounds.

The patient's therapeutic scheme was adjusted as follows on the basis of the original treatment: 10 mg Olanzapine orally every night, higher oral doses of Paliperidone (9 mg once daily) and magnesium valproate (0.5 g twice daily), and an intravenous drip of a hibernation mixture (12.5 mg Chlorpromazine + 12.5 mg Promethazine once daily) to control psychiatric symptoms.

After these treatments, the patient continued to talk to himself in bursts, and repeated the words 'Tianshan medicinal herbs'. In response to questions, the patient would answer the questions and then continue repeating his answers. The patient's concentration was impaired, without abnormality in the quality of sleep at night and appetite. Based on the symptoms of stereotypic behaviour, psychomotor excitement and behavioural impulsiveness, the diagnosis was revised to catatonia. In view of this diagnosis, Olanzapine, Paliperidone and hibernation mixture treatments were withdrawn and replaced with Clonazepam tablets orally (1 mg in the morning and afternoon, and 3 mg before going to bed), along with 0.1 g Sulpiride orally twice daily, 0.1 g Amantadine orally twice daily, and 0.2 g Citicoline Sodium orally twice daily. The head MRI plain scan and DWI were repeated on 10 November 2021. Compared to the previous imaging results of 26 October 2021, the DWI signals slightly increased in the right occipital cortex, along with slight increases in the T2 and FLAIR signals; the nature of these signals was unknown with great possibility of artifact (other possibilities are not excluded). There were a few ischaemic foci in the bilateral frontoparietal lobes, accompanied by bilateral maxillary sinusitis, ethmoid sinusitis, and hypertrophy of bilateral inferior nasal concha. Overall, the new scans found no obvious changes from the previous results (figure 3).







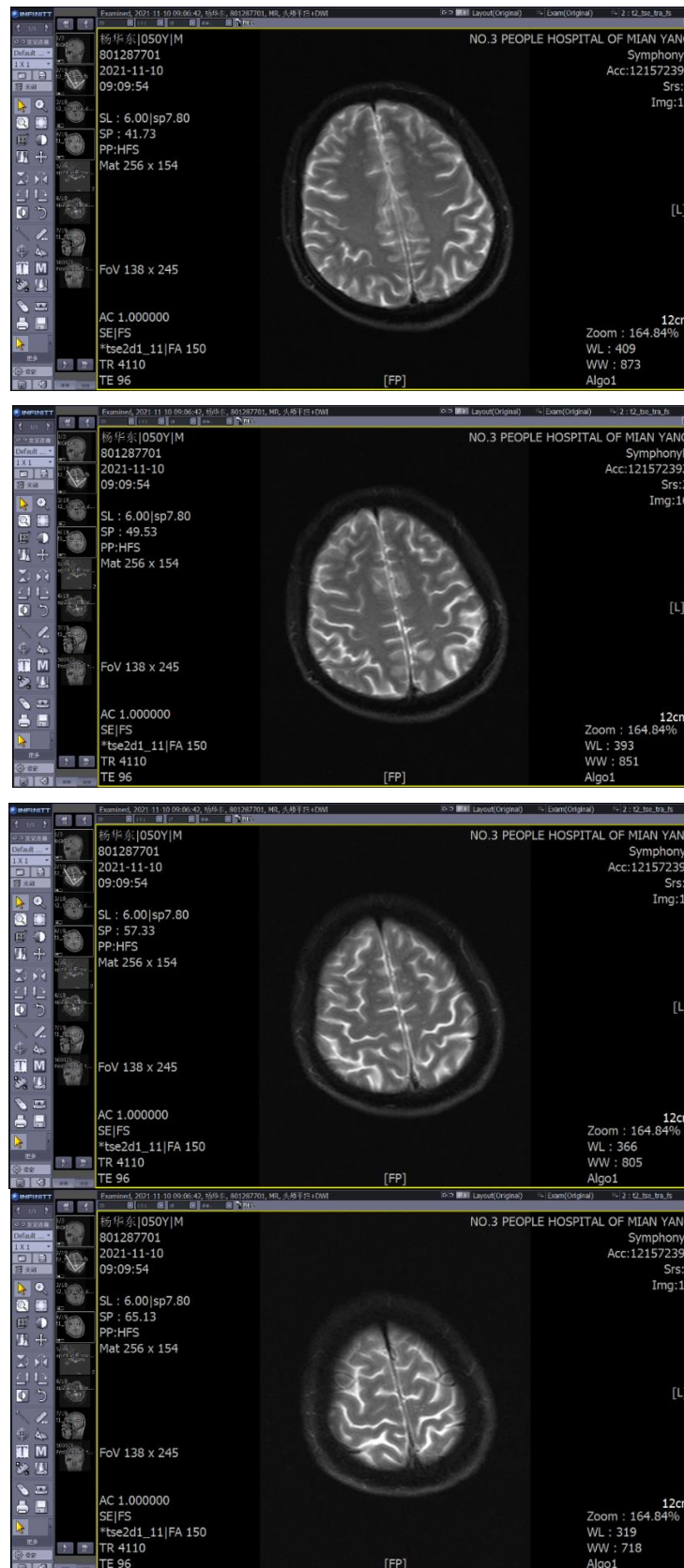


Figure 3 Brain MRI+DWI

The treatment for catatonia resulted in a gradual improvement in the patient's symptoms. The night time paroxysmal noises and stereotypic speech stopped. The patient was now able to understand other people's speech and answer other people's questions correctly. The patient no longer behaved impulsively and noisily, with complete recovery of insight, and was discharged from the hospital.

## 2. Discussion

Catatonia is a psychomotor syndrome that occurs as a result of physiological and psychological factors. It often presents with symptoms such as tension or agitation, as well as stereotypic movements and waxy flexibility<sup>[1]</sup>. Many reports of catatonia were reported in the early 20<sup>th</sup> century; however, its incidence and prevalence rates have decreased significantly in recent decades<sup>[2]</sup>. A possible reason for this decrease is the improved accuracy in evaluating the symptoms and signs of catatonia. In addition to the common symptoms of tension and agitation, catatonic patients may also display impulsive and aggressive behaviours, as well as disobedience, stereotypic movements, pretentious acts and grimaces. Catatonia can also be diagnosed through tests during physical examinations, such as reflex and physical flexibility tests and the presence of compulsive syncope<sup>[3]</sup>. According to DSM-V, psychomotor abnormalities are common in mood disorders, schizophrenia spectrum diseases, delirium. The psychomotor symptoms of catatonia comprise the core criteria for diagnosing autism spectrum disorders<sup>[1]</sup>. DSM-V recognises catatonia as an independent mental disorder, and its diagnosis is indicated when subjects meet  $\geq 3$  of the following 12 symptoms: numbness, rigidity, waxy flexibility, silence, disobedience, unusual posture, affectation, stereotypic movements, agitation, grimaces, echophrasia, and echopraxia. Moreover, DSM-V recognises three subtypes of catatonia, i.e. catatonia related to other mental disorders, catatonia caused by other physical causes, and catatonia due to unspecified causes<sup>[1]</sup>.

Aside from the diagnostic criteria in DSM-V, catatonia can also be diagnosed according to the Bush-Francis Catatonia Rating Scale (BFCRS)<sup>[4]</sup>. However, there is still insufficient evidence for the identification and detection of catatonia by using BFCRS<sup>[5]</sup>. At present, catatonia can be attributed to various factors such as abulia, fear, infection and imbalance in the immune system<sup>[6]</sup>. A systematic review found that approximately 20% of catatonia can be attributed to external factors, whereas approximately 29% of cases are due to central nervous system inflammation (including infection and immune factors)<sup>[7]</sup>. Furthermore, the onset of catatonia can be induced by multiple infectious diseases, although it is still unclear exactly how such infections cause catatonia. Possible explanations include direct neurotoxicity, psychological reaction after infection, or regulation of the immune system after acute infection<sup>[6; 8]</sup>.

Catatonia is commonly treated with benzodiazepines and electroconvulsive therapy (ECT)<sup>[9]</sup>. Drugs that target the regulation of the immune system are considered novel treatments. Among therapeutic drugs, benzodiazepines are positive allosteric modulators of the  $\gamma$ -aminobutyric acid (GABA<sub>A</sub>) receptor (GABA plays an important role in inhibiting the immune response)<sup>[10]</sup>. However, a previous study found that catatonia is associated with higher monocyte counts, which may indicate a poor response to benzodiazepines<sup>[11]</sup>. It should be noted that specific benzodiazepines, such as diazepam and lorazepam, are used to treat tension, and both of these drugs bind to the translocator protein (TSPO), a mitochondrial protein that is related to phagocyte activity, immune cell migration, and cytokine function<sup>[12; 13]</sup>. In addition to benzodiazepines and ECT, catatonia can also be treated by N-methyl-D-aspartic acid receptor (NMDA) receptor antagonists, atypical antipsychotics, antiepileptic drugs and selective serotonin reuptake inhibitors; and other measures include non-invasive neuromodulation procedures, such as transcranial magnetic stimulation and transcranial direct current stimulation (tDCS)<sup>[14]</sup>. Amantadine and its derivative Memantine can block the NMDA channel and accelerate channel closure, and both drugs are regarded as non-competitive NMDA receptor antagonists<sup>[15]</sup>. These two drugs also have effects on serotonin, dopamine and acetylcholine. The mechanism involved in the clinical application of both drugs is NMDA antagonism. Moreover, NMDA antagonists that are used to treat catatonia may also exert their therapeutic effects by inhibiting glutamate, an activity that may remedy the functional deficiency of GABA<sup>[16]</sup>.

This case report describes the diagnosis and treatment of a catatonic patient. Our experience suggests that clinicians should consider catatonia when encountering patients displaying stereotypic speech and hyperactivity. There is a need to improve the relevant examinations used to identify the aetiology of catatonia. While the treatment of catatonia is relatively simple, there is still a need to further explore its pathogenesis.

## References

- [1] Tandon R, Heckers S, Bustillo J, et al. Catatonia in DSM-5[J]. *Schizophr Res*, 2013, 150(1): 26-30. DOI: 10.1016/j.schres.2013.04.034.
- [2] Fink M. Catatonia: a syndrome appears, disappears, and is rediscovered[J]. *Can J Psychiatry*, 2009, 54(7): 437-45. DOI: 10.1177/070674370905400704.
- [3] Walther S, Stegmayer K, Wilson JE, et al. Structure and neural mechanisms of catatonia[J]. *Lancet*

- Psychiatry, 2019, 6(7): 610-619. DOI: 10.1016/s2215-0366(18)30474-7.
- [4] Bush G, Fink M, Petrides G, et al. Catatonia. I. Rating scale and standardized examination[J]. *Acta Psychiatr Scand*, 1996, 93(2): 129-36. DOI: 10.1111/j.1600-0447.1996.tb09814.x.
- [5] Oldham MA, Lee HB. Catatonia vis-à-vis delirium: the significance of recognizing catatonia in altered mental status[J]. *Gen Hosp Psychiatry*, 2015, 37(6): 554-9. DOI: 10.1016/j.genhosppsych.2015.06.011.
- [6] Rogers JP, Pollak TA, Blackman G, et al. Catatonia and the immune system: a review[J]. *Lancet Psychiatry*, 2019, 6(7): 620-630. DOI: 10.1016/s2215-0366(19)30190-7.
- [7] Oldham MA. The Probability That Catatonia in the Hospital has a Medical Cause and the Relative Proportions of Its Causes: A Systematic Review[J]. *Psychosomatics*, 2018, 59(4): 333-340. DOI: 10.1016/j.psym.2018.04.001.
- [8] Waisman A, Liblau RS, Becher B. Innate and adaptive immune responses in the CNS[J]. *Lancet Neurol*, 2015, 14(9): 945-55. DOI: 10.1016/s1474-4422(15)00141-6.
- [9] Wachtel LE. Treatment of catatonia in autism spectrum disorders[J]. *Acta Psychiatr Scand*, 2019, 139(1): 46-55. DOI: 10.1111/acps.12980.
- [10] Prud'homme GJ, Glinka Y, Wang Q. Immunological GABAergic interactions and therapeutic applications in autoimmune diseases[J]. *Autoimmun Rev*, 2015, 14(11): 1048-56. DOI: 10.1016/j.autrev.2015.07.011.
- [11] Rao NP, Mutalik NR, Kasal V, et al. Monocyte abnormality in catatonia: revisiting the immune theory of catatonia[J]. *J ect*, 2011, 27(3): e53-4. DOI: 10.1097/YCT.0b013e318212ecaa.
- [12] Ramirez K, Niraula A, Sheridan JF. GABAergic modulation with classical benzodiazepines prevent stress-induced neuro-immune dysregulation and behavioral alterations[J]. *Brain Behav Immun*, 2016, 51: 154-168. DOI: 10.1016/j.bbi.2015.08.011.
- [13] Fernández Hurst N, Zanetti SR, Báez NS, et al. Diazepam treatment reduces inflammatory cells and mediators in the central nervous system of rats with experimental autoimmune encephalomyelitis[J]. *J Neuroimmunol*, 2017, 313: 145-151. DOI: 10.1016/j.jneuroim.2017.09.012.
- [14] Beach SR, Gomez-Bernal F, Huffman JC, et al. Alternative treatment strategies for catatonia: A systematic review[J]. *Gen Hosp Psychiatry*, 2017, 48: 1-19. DOI: 10.1016/j.genhosppsych.2017.06.011.
- [15] Carroll BT, Goforth HW, Thomas C, et al. Review of adjunctive glutamate antagonist therapy in the treatment of catatonic syndromes[J]. *J Neuropsychiatry Clin Neurosci*, 2007, 19(4): 406-12. DOI: 10.1176/jnp.2007.19.4.406.
- [16] Hutchison L, Silber Y, Rollhaus E, et al. Amantadine Augmentation in Pediatric Catatonia: A Case Report and Review of the Literature[J]. *Psychosomatics*, 2020, 61(2): 193-199. DOI: 10.1016/j.psym.2019.08.003.