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Correlation between Parkinson's Disease and Glutamate Metabolism

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Abstract: Parkinson's disease is a degenerative disease of the nervous system, which mainly occurs in middle-aged and elderly people. With the deepening of disease research, it is found that there is a close relationship between the emergence of the disease and the pathological changes of the "substantia nigra" cells in the brain, leading to decreased dopamine synthesis, inhibition of the function of acetylcholine, increased acetylcholine excitability, and paralysis. In recent years, studies have found that abnormal glutamate metabolism is also an important factor affecting Parkinson's disease, which plays an important role in the treatment of the disease. Therefore, studies on the correlation between Parkinson's disease and glutamate metabolism will provide better conditions for comprehensive understanding and treatment of the disease.

Parkinson's disease (PD), also known as tremor paralysis, is a central nervous degenerative disease second only to Alzheimer's disease, which has a high incidence in middle-aged and elderly people. As a disease of dyskinesia, PD has a complex pathogenesis, which affects the whole body. The non-symptoms appear before the clinical signs of movement. The symptoms mainly include olfaction, autonomic dysfunction and sleep disorder. Besides tremor, the signs of movement also include static tremor, decreased movement, abnormal gait and other symptoms [1-2]. In the late stage, in addition to the above symptoms, patients will also have cognitive disorders, intellectual disorders, and even anxiety, depression, restlessness. In recent years, the incidence of the disease has increased significantly, becoming the main cause of disability among middle-aged and elderly people [3]. The Chennai Laishi study found that abnormal glutamate metabolism has become an important factor affecting Parkinson's disease. This paper analyzes the correlation between Parkinson's disease and glutamate metabolism. The specific contents are as follows:

1. PD Overview

PD is a chronic neurodegenerative disease of the central nervous system caused by extrapyramidal system dysfunction. It was first proposed by the British. Typical clinical symptoms include tremor,

muscle stiffness, motor retardation, and impaired postural reflex. In serious cases, it will be accompanied by memory impairment and dementia [4]. At present, the pathogenesis of the disease has not been completely clear. Clinical studies have proposed the loss of DA ergic neurons, mitochondrial dysfunction, oxidative stress, excitotoxicity, inflammatory reaction, glial cell proliferation, etc. There is a mutual connection and causal relationship between different theories. At present, the pathological changes of "substantia nigra" cells in the brain have been recognized by most scholars. This theory holds that the decrease of dopamine in striatum leads to damage and degeneration of substantia nigra [5].

With the deepening of the research, the research on the relationship between PD and glutamate metabolism has been deepening, and it is believed that there is a close relationship between the disease and glutamate metabolism. Dopamine in the substantia nigra density area leads to the loss of neurons, which ultimately increases the activity of indirect pathways. Especially, glutamate in the subthalamic nucleus increases the activity of neurons, and extrapyramidal lesions appear [6]. Relevant studies have pointed out that [7]: The increase of glutamate synthesis will produce excessive excitotoxicity, projecting the excitability of neurons to the substantia nigra. After dopamine damages neurons in the substantia nigra density area, glutamate can make neurons abnormally active, increase the amount of release, leading to the loss of a large number of calcium ions in the body. However, the overload of calcium ions in neurons will trigger a series of cascade reactions, which will eventually lead to neuronal degeneration and necrosis.

2. Correlation between Parkinson's disease and glutamate metabolism

At present, glutamate receptors are divided into ionophilic receptors and metabotropic receptors, which are closely related to the occurrence and development of diseases. The specific contents are as follows:

2.1. Iophilic receptors

Iophilic glutamate receptors can mediate rapid excitatory synaptic transmission and play an important role in the occurrence and development of Parkinson's disease. Studies have shown that [8-9], the ionophilic receptor can accelerate the progress of the disease, and microinjection of GluR2/3 antagonist into the striatum can eliminate the positive effects of exercise, further confirming that mGluR2/3 plays an important role in the exercise dependent plasticity of MSNs in the striatum of PD model rats.

2.2. Parental metabolite receptor

Iophilic receptor is a type of G protein coupled receptor, which can be named 1-8 different groups in combination with different coding genes that have been cloned. It is homologous with amino acid series. It is analyzed in terms of signal transduction mechanism and pharmacological characteristics, and there are similarities between metabotropic receptor 1 and group 5, group 2 and group 3, group 4, group 6, group 7 and group 8. Research shows that [10], each subtype of the metabotropic receptor is very closely related in terms of structural genes, and shows polymorphism. In the process of RNA editing, variants are formed by editing each other. After being activated, it can promote the activation of phospholipase C, so that phosphoric acid hydrolysis can produce diacylglycerol and inositol triphosphate, which can increase the probability of abnormal mediated occurrence and increase the neurotoxicity. The specific manifestations are as follows:

2.2.1. Regional distribution

The first group of metabotropic receptors was mainly distributed around the postsynaptic membrane of the intermediate spiny neurons projected from the striatum and the glutamate ergic synapses of the pallidum in the subthalamic nucleus. At the same time, the first group of receptors was also expressed at the synaptic sites of the subthalamic neurons. The first group of metabotropic receptors on the postsynaptic membrane of the substantia nigra region can enhance the excitability of the substantia nigra density region and depolarize dopaminergic cells [11]. While the second group of metabotropic receptors are mainly distributed on the terminal presynaptic membrane of neurons in the subthalamic nucleus, the seventh group of subtypes is located on the substantia nigra synapses of neurons in the subthalamic nucleus and the presynaptic membrane symmetrical in the reticular part of substantia nigra. The fourth group of subtypes is most abundant in the striatum globus pallidus synaptic site, and the selective agonists can selectively weaken the indirect pathway conduction, leading to the weakening of the role of the indirect pathway [12].

2.2.2. Behaviors

The first group of metabotropic receptors can activate the current of N-methyl-D-aspartate receptors that are also located on the cell membrane. The data show that [13] after striatal injection, the behavior results of the first group of receptor agonists and the early gene expression in the key regions of the subthalamic nucleus are high, so as to increase the transmission of indirect pathways [13]. The second group of metabotropic receptors can be distributed in cholinergic intermediate neurons, which can selectively activate the activity of indirect pathways and induce muscle stiffness. The third group of metabotropic receptors mainly exist at the end of the direct pathway. After activation, they can inhibit the conduction of Y-aminobutyric acid neurons, enhance the output of the cortical nuclear tract, and play a role in the pallidum [14].

2.2.3. Electrophysiology

In the study of the pathological mechanism of Parkinson's disease, it was found that the enhanced activity of the indirect pathway, especially the high activation of the subthalamic nucleus, was an important factor leading to the disease. The first group of metabotropic receptors polarized subthalamic nucleus neurons, reducing the concentration effect relationship and controlling the discharge frequency. However, the second group of metabotropic receptors are mainly distributed on glutamate neurons. After activation, they can inhibit excitatory postsynaptic units, reduce their induction, reduce the synaptic activity of glutamate neurons in the rostral area of the subthalamic nucleus, and accelerate the progress of the disease [15].

3. Progress of glutamate intervention in Parkinson's disease

After studying the relationship between glutamic acid and Parkinson's disease, more ideal intervention can be carried out for the disease. Western medicine mainly treats the disease through drugs, including amantadine, Pramipexole, etc. The common drugs include amantadine, which can reduce the fluctuation stimulation of dopamine support after use, prevent the over activation of glutamic acid, and reduce the incidence of post synaptic gene, protein expression and neuronal mode changes, The output of direct and indirect pathways will not be affected, the balance between the two pathways will be maintained, and the disease will be effectively treated; Pramipexole is a non-ergotamine dopamine receptor agonist. Its mechanism of action is similar to amantadine, but it can also control patients' depression through the agonist D3 receptor and effectively control complications [16].

Traditional Chinese medicine has also conducted in-depth research on Parkinson's disease. Wang Zheng, Chen Qingqing and Liu Runni [17] analyzed the therapeutic effect of Tianma Gouteng Yin, and found that the prescription can reduce the glutamic acid index of patients, inhibit its toxicity, protect the damaged nervous system, reduce the oxidative stress response, and improve exercise symptoms. After treatment, the levels of Glu, Asp and GABA were (67.51 ± 3.15) μ mol/L,(25.97±1.72) μ mol/L,(287.49±5.01) μ mol/L, higher than that before treatment, and achieved good therapeutic effect. Wang Zheng, Chen Qingqing and Liu Runni also pointed out that Gastrodia elata Hook Teng can inhibit glutamate and protect damaged cells. The levels of Glm and GABA in patients in the observation group were (70.73 ± 5.03) and (289.26 ± 5.24) respectively μ MolL is significantly higher than that before treatment, and the effective rate of disease treatment is high.

4. Conclusion

Parkinson's disease is a common degenerative disease of the senile nervous system in the world, which poses a serious threat to the health of the body. With various non-motor symptoms, it is necessary to control the disease in time. In the study of the disease, it was found that there was a close relationship between glutamate metabolism and the occurrence and development of the disease, which affected the progress of the disease. Therefore, after in-depth analysis of the relationship between the two, various means were used to intervene in abnormal glutamate metabolism, control the progress of the disease while reducing the incidence of the disease, provide new theories, ideas, methods and breakthroughs for disease prevention and control, and provide more complete Accurate data and information can improve the quality of disease intervention.

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