

A brief analysis of traditional Chinese and Western Medicine on the pathomechanism of spastic cerebral palsy in children

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Abstract: Pediatric spastic cerebral paralysis is a common type of pediatric cerebral palsy, and its clinical manifestations contain movement disorders, behavioral cognitive disorders, secondary musculoskeletal problems, secondary epilepsy and so on. Western Medicine believes that this is a brain disease with nerve abnormalities, while traditional Chinese medicine (TCM) considers that the disease is linked to abnormalities in the brain, but the radical pathogenesis is the deficiency of the liver, spleen and kidney, which can help the liver wind with blood rush to the brain. Although TCM and Western Medicine have different pathological understanding in pediatric spastic cerebral paralysis, but since the Huitong School of TCM and Western Medicine in the late Qing Dynasty, TCM and Western Medicine has been combined with Western Medicine knowledge, and we can better understand the connection among the liver, kidney, spleen and brain. Based on this background, this paper discussed the difference and connection between the perspective of Western Medicine pathology and TCM pathogenesis to analyze the mechanism of pediatric spastic cerebral paralysis.

1. Introduction

The pathological changes of spastic cerebral palsy in children are developed by the defects of the brain. The clinical manifestations of this disease are movement disorders and cognitive disorders^[1], which seriously affect normal growth and development, daily life, and school work. This paper explored the pathological mechanism of pediatric spastic cerebral paralysis from the knowledge of TCM and Western Medicine, and guided the research and treatment of this disease.

2. Western Medicine understanding of pediatric spastic cerebral palsy

2.1. Etiology and clinical manifestations of Western Medicine

Children with spastic cerebral palsy have abnormal muscle tone^[2]. There are abnormal postures

such as shoulder adduction, trunk forward flexion, wrist flexion, knee flexion, ankle clonus, and scissors gait that happened in Pediatric spastic cerebral palsy. These symptoms are highly consistent with the performance of "five kinds of retardation", "five kinds of flaccidity" and "five stiffness" in TCM^[3]. So the diseases described by the western medicine and TCM can be referred to each other. The causes of spastic cerebral palsy include genetic factors, autoimmune diseases, ischemia and hypoxia, infection, jaundice, metabolic disorders, etc.

2.2. Western Medicine pathology

With the development of functional MRI, it is easy to see the pathological changes of cerebral palsy clearly^[4], which contains ventricular leukomalacia, focal cerebral ischemia, cerebral infarction, split-brain malformation, cerebral atrophy, and other changes. These pathological changes obtained by MRI can be summarized as hemorrhagic and ischemic brain damage^[5]. Whether it is cerebral hemorrhage or cerebral ischemia, it will cause fetal or pediatric brain tissue ischemia and hypoxia, it can lead to abnormal metabolism, ions flow of abundance calcium, neuronal edema, and necrosis. After that, neuron necrosis will lead to brain tissue ischemia and hypoxia, which cause a large number of amino acids will be excited to release. After amino acids combine with receptors, calcium and sodium ions in the cell will increase abnormally, so neurotoxicity will occur cell edema and neurotoxic effects. In addition, the infection can also produce neuroinflammation^[6]. When the pathogen infects cells, it will produce specific cytokines that increase the permeability of the blood-brain barrier in the fetus, then will enter the brain and trigger neuroinflammation. Complex pathological changes have occurred in the central nervous system, which can damage the corresponding parts of the brain and then lead to the occurrence of cerebral palsy. Therefore, the cerebral palsy disease can be studied with the theory of neuroinflammation^[7]. Studies have shown that Alzheimer's disease (AD), Chen motor dance disease (PKC), Huntington's disease (HID), Parkinson's disease (PD), 0 and other neurologic diseases also have neuroinflammatory reactions^[8]. In recent years, the theory of neuroinflammation has been widely studied and applied in the pathological mechanism and treatment of cerebral palsy diseases^[9]. The neuroinflammation of Western Medicine in TCM refers to phlegm and blood stasis, which are pathological products. Infants and young children are prone to deficiency of the liver, spleen, Qi, and blood, which will lead to liver wind agitation, then the wind carries blood up to the brain. As a result, Infants and young children are more likely to appear with cerebral hemorrhage or cerebral ischemia.

3. Understanding of pediatric spastic cerebral palsy in TCM

TCM believes that pediatric spastic cerebral palsy belongs to the category of "five kinds of retardation", "five kinds of flaccidity", "five stiffness" and "febrile disease with symptoms such as convulsion". This "five" is caused by the deficiency of Qi, blood, and body fluid. Zhongjing Zhang believes that "febrile disease with symptoms such as convulsion" is a more serious performance of body fluid loss^[10]. Therefore, the etiology of pediatric spastic cerebral palsy is related to the lack of Qi, blood, and body fluid. Children's physical characteristics contain that: the heart and liver are easy to be hyperactive; the lung, spleen, and kidney are Lacking in function; the liver is more prone to appear liver wind agitation^[11]. If children were born with inadequacies, such as lack of renal essence and insufficiency of marrow-sea, they would be prone to poor growth; if children are acquired deficiencies like defective spleen and stomach, poor digestive function, and Qi and blood deficiency, they will be prone to be body burnout, limb weakness; if children are lack of liver blood as well as causing the muscles to lose nourishment, they will be prone to movement disorders. To sum up, TCM believes that the pathomechanism of spastic cerebral palsy in children is a congenital deficiency of the liver and kidney, bone deprived of the nourishment of renal essence, and sinews deprived of blood-

fed. The twelve sinews system, governed by the brain, is responsible for the movement of the body^[12]. To sum up, this disease is associated with brain lesions, but the root cause is the lack of function of the liver, spleen, and kidney.

4. The association of TCM and Western Medicine

Western Medicine believes that pediatric spastic cerebral palsy is caused by a variety of reasons (neuroinflammation), cerebral hemorrhage, cerebral ischemia, cerebral atrophy, cerebral infarction, or other brain pathological changes in the brain. TCM believes that pediatric spastic cerebral palsy is caused by a deficiency of liver, spleen, kidney, Qi, blood, and body fluid, which will cause the blood up to the brain with liver-wind hyperactivity. Whether from the understanding of the etiology or the difference of treatment methods, we can find that Western Medicine believes that the position of the disease is in the brain; TCM believes that the position of the disease is in the liver, spleen, and kidney. TCM did not discuss much about the brain, until in the late Qing Dynasty, a group of traditional Chinese medicine scholars studied the knowledge of Western Medicine and then combined it with the theory of TCM. They founded the Huitong school of TCM and Western Medicine. Bo-long Zhang, Xi-Chun Zhang, Shan-lei Zhang, and others put forward some theories that can answer the inconsistent understanding of pediatric spastic cerebral palsy between TCM and Western Medicine. Western Medicine has proved that the disease is caused by abnormalities of the brain and nerves. The following will analyze the connection between the liver, kidney, spleen, and brain with theoretical knowledge of TCM.

5. The association between the liver, kidney, spleen, and brain

5.1. Brain-Qi-fascia theory

Brain-Qi-fascia was proposed by a British Missionary^[13]. The theory of Brain-Qi-fascia was put forward by the Huitong School of TCM and Western Medicine, which is similar to the brain and nervous system. The brains generate Brain-Qi-fascia, which is generated by the combination of Yin and Yang from the kidney, and then it is injected into the brain along Governor Vessel. Brain-Qi-fascia depends on the effect of ZongQi, gathering in the breast, to transport substances to the brain^[14]. ZongQi is injected into the brain through the Conception Vessel. Therefore if the ZongQi is deficient, then the brain will be deficient. The fascia belongs to the liver, and is the transport of Qi, blood, and body fluid. Then the fascia is connected to the brain and controlled by the brain. The formation of ZongQi is closely related to the normal function of the spleen, kidney, lung, and liver. Tong-Zhen Shao once said: "Brain-Qi-fascia regulate the Zang and Fu and dominate the physical and perceptual activity of the body."^[15]It can be seen that the function of the Brain-Qi-fascia is the same as the function of the western nervous system, which can dominate the physical and perceptual activity of the body. To sum up, Brain-Qi-fascia is a theory dominated by the brain, supported by the kidney, spleen, and liver. What's more, it can dominate the physical and perceptual activity of the body.

5.2. Brain-Qi-fascia is connected to the brain

The fascia and membrane of tri-jiao belong to the liver according to Huangdi Neijing^[16]. Therefore the fascial and membranous system is throughout cells and tissues in the body, being similar to a pipe network. Therefore, five viscera and six entrails are also interconnected with the fascia and membrane of the liver and are regulated by the brain. Tracing to its source, the fascia comes from the brain and can transport nutrients to support the body. The process of the formation of the human body is that

the essence hidden in the kidney is generated firstly. And then the essence generates the brain and liver, the liver generates the heart, the heart generates the spleen, and the spleen generates the lung. These are the laws of interpromoting relation in five elements. In conclusion, the kidney is the root of the liver and brain, and the fascia of the liver controlled by the brain is also extended from the brain. The fascia and membrane are equivalent to the role of the central nervous system because they are both Controlled by the brain and can dominate the system of motor and sensory. To sum up, although there are differences between the viscera that govern movement and perception in TCM and Western medicine, they share a common pattern.

5.3. The effect of the liver and kidney on the spleen

Innate essence is hidden in the kidney, and the acquired essence is generated by the digestive of the spleen and stomach. These innate and acquired essences nourish each other and keep warm and nourish the human body together. The liver can help the digestive of the spleen and stomach. With the help of the liver, the spleen and stomach will transport the essence of Qi from the veins to the whole body and to the heart to generate blood. The participation of the liver in the generated process of blood reflects that the liver has the function of transporting Qi, blood, and body fluid. The kidney called kidney Yin contains essence, Qi, blood, and body fluid^[17]; The kidney called kidney Yang is also known as the kidney Qi generated by renal essence. Kidney Yin and Kidney Yang can nourish all the viscera.

5.4. Liver can transport Qi and blood and generate blood

The liver can transport Qi and blood and produce blood^[18]. The liver can hide raw blood^[19]. The participation of the liver in blood production is manifested in three aspects. Firstly, the liver helps the spleen, stomach, and heart produce blood. Secondly, the renal essence can produce blood. Thirdly, the liver can clear stasis and spawns new blood. After the digestion of the spleen and stomach, the dietary nutrients are transported to the whole body through the fascias and veins to the heart to generate blood. The material basis of the production of blood is not only in the spleen and stomach but also in the kidney. Renal essence can generate blood^[20]. Renal essence produces the brains, the brains produce the liver, and the essence and brains can produce blood^[21]. These theories have linked blood with the liver and kidney. The theory of "bad blood returns to the liver" was first proposed by Li Gao^[22]. This "bad blood" refers to blood that cannot be used by the human body^[23]. This theory confirms that the liver can sweep away bad blood and produce new blood. The liver Qi can unchoke the Qi of the whole body and help generate new blood, the blood of the liver can inhibit the hyperactivity of liver qi. To sum up, the Qi of the liver and the blood of the liver, one Yin and one Yang, are used for each other.

5.5 Wind is related to the liver

The wind was generated by the movement of Qi. The genial wind of nature can help all plants' growth. Man and nature have the same law of nature. Therefore, the wind is closely related to the liver in the human body, having the role of nourishing the human body when the function of the liver is normal. The brutal wind in nature can destroy everything, and the liver-wind stirring can also lead to diseases. If the body appears blood deficiency, blood stasis, or even renal essence deficiency, liver Yang will lose liver Yin restriction and then show symptoms of liver wind agitation. Children are more likely to appear the performance of the liver wind stirring. Because the liver is related to the wind and the brain, the liver wind stire up the blood into the brain which is prone to cerebral hemorrhage. To sum up, treatment measures for spastic cerebral palsy must treat the liver.

5.6. The association between heart, brain, and liver

The fascia of the liver and tri-jiao are extended from the fascia of the brain, so the brain can convey information to the whole body and dominate the movement of the body. TCM believes that the function of the brain dominating consciousness and thinking activities belongs to the heart. To explain the relationship between the brain and the heart, the brain belongs to the system of the pericardium and listens to the heart. To show that the brain is also closely related to other viscera, the fascia of the brain belongs to the liver, tri-jiao, and pericardium, and the membrane of the brain belongs to the kidney. The brain, being mastered by the heart, need Qi and blood to maintain normal nervous system function. The eyes can transport the information to the brain and then the brain gives commands and instructions. What's more, the process is dominated by the heart and needs to be nourished by the function of the liver, spleen, and kidney. And the process also depends on the role of Zong Qi. If Zong Qi is deficient, it will be easy to appear the performance of cerebral ischemia^[24].

6. Therapeutic methods

The pathological mechanism of spastic cerebral paralysis in children is abnormal cerebral development, cerebral hemorrhage, cerebral ischemia, cerebral atrophy, and other brain lesions. The origin of the disease is that the liver wind stir up the blood into the brain because of the deficiencies of the liver, spleen, and kidney. Therefore, the treatment of plastic cerebral paralysis in children in TCM and Western medicine treatment contains stem cell transplantation, drug treatment, nerve easy generation therapy, rehabilitation technologies, acupuncture therapy, massage therapy, and herbs. In traditional Chinese medicine treatment, we should pay attention to regulating the liver function because the liver is connected to the brain and the liver wind is easy to invade the brain.

7. Summary

Pediatric cerebral palsy can lead that system of motor and cognitive to become abnormal. The most common type is pediatric spastic cerebral palsy in children^[25]. This paper talks about the understanding of the etiology and pathological mechanism of pediatric spastic cerebral palsy from the perspectives of TCM and Western Medicine and analyzes the correlation between the two differences. Although the lesion of this disease is in the brain, it is traced back to the deficiency of the liver, spleen, and kidney, and the liver wind with blood rush to the brain. According to this understanding, it is believed that integrated treatment of TCM and Western Medicine should be treated to provide effective treatments for children with spastic cerebral palsy.

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