

The Pathogenesis and Treatment Status of Posterior Circulation Ischemic Vertigo

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Abstract: Posterior circulation ischemic vertigo refers to dizziness induced by ischemia of the vertebral basilar artery caused by a variety of factors. In Chinese medicine, this disease is categorized as "vertigo". In recent years, with the development of medical imaging and its wide application in clinical practice, the pathogenesis, clinical manifestations, treatment status and care of posterior circulation ischemic dizziness have been studied in greater depth. Therefore, this study discusses the research situation in recent years, such as the pathogenesis and treatment of posterior circulation ischemic vertigo in Western medicine, as well as the typing and identification of symptoms and treatment of posterior circulation ischemic vertigo in traditional Chinese medicine. The pathogenesis of posterior circulation ischemic vertigo and the current status of clinical treatment in Chinese and Western medicine will be further analyzed in order to provide reference and basis for the clinical diagnosis and treatment of posterior circulation ischemic vertigo.

Keywords: Posterior circulation ischemic vertigo, Pathogenesis, Chinese medicine, Western medicine, Current status of treatment.

1. Introduction

The posterior circulation [1] refers to the vertebrobasilar system, whose main branches include the posterior cerebral artery, superior cerebellar artery, anterior-inferior cerebellar artery, posterior-inferior cerebellar artery, and internal auditory artery. In this case, the attack of vertigo is generally dominated by lesions of the following arteries, i.e., the internal auditory artery, anterior inferior cerebellar artery, and posterior inferior cerebellar artery, and the onset of vertigo mostly occurs in middle-aged and old-aged groups, and is characterized by difficulty in eradication, recurrent episodes, and a long course of the disease, which can lead to poor prognosis of the patient if the treatment is delayed or improperly treated. Posterior circulation ischemia [2] (PCI) can be divided into posterior circulation transient ischemic attack and cerebral infarction, both of which are characterized by vertigo, accompanied by cranial tinnitus, nausea and vomiting, or limb incoordination and other symptoms. Posterior circulation ischemia vertigo (PCIV) is vertigo caused by ischemic lesions in the vertebral basilar artery system, and the main lesions are due to low blood pressure, atherosclerosis, and so on. In recent years, as the incidence of PCI vertigo has been increasing year by year, more and more researchers have begun to pay attention to this disease. For example, among the 685 elderly patients with vertigo studied by Mo Yan et al, 44.4% of them can be categorized as PCI vertigo [3]. In addition, relevant reports [4] show that in China, the proportion of patients with posterior circulation ischemic vertigo in the vertigo patients can reach 60%, the patients are more common in the middle-aged and elderly people, and in the middle-aged and elderly people, the incidence rate of males can be up to 39%, and the incidence rate of females can be as high as 57%. Thus, the author hopes to summarize the mechanism and treatment of PCI vertigo, as well as the TCM treatment of posterior circulation ischemic vertigo by reviewing the relevant literature in the past decade, with the aim of providing a basis and reference for the future research and clinical treatment of posterior circulation ischemic vertigo.

2. Pathogenesis in Western Medicine

2.1 Atherosclerosis

It mainly refers to ischemia caused by blockage of the lumen by scattered plaques that can be formed in the inner wall of the patient's large and medium arteries due to lipid deposition [5]. Atherosclerosis, as the most important cause of PCI vertigo, is a common and highly prevalent area with the beginning of vertebral arteries [6]. The influencing factors [7] are hyperlipidemia, hypertension, hyperglycemia, protein glycosylation, inflammatory response, and sustained oxidative stress injury. Among them, abnormal lipid metabolism caused by oxidative stress [8], is the main cause of the development of atherosclerosis, specifically oxygen free radicals can promote the development of atherosclerosis by facilitating the production of lipid peroxide, promoting the accumulation of lipids in the vascular wall and the formation of loose foam cells.

2.2 Arterial Embolism

Arterial embolism is the second major cause of ischemia in the posterior circulation. Blood coagulation can be caused by abnormal aggregation of platelets and increased blood viscosity, which can lead to luminal embolism of important blood vessels such as posterior basilar artery and vertebral artery, resulting in posterior circulation ischemia and dizziness [9]. Some scholars have shown [10] that the incidence of posterior circulation ischemic stroke is highest in embolic stroke, followed by atherosclerotic stroke, which can account for 32%, and emboli in embolic stroke mainly originate from the proximal vertebral basilar arteries, the heart, and the aorta. It is worth noting that branch arterial disease accounts for approximately 14% of all strokes, so embolism control should also be an important part of the prevention and treatment of posterior circulation ischemia.

2.3 Penetrating Artery Lesions

Penetrating artery lesions are most commonly found in the midbrain, thalamus, and pons [11]. Other important factors causing ischemia in the posterior circulation are perforator artery lesions, subclavian artery embolism, vertebral artery hypoplasia, and basilar artery hypoplasia [12]. However, posterior circulation ischemic vertigo due to penetrating artery lesions is clinically less common than atherosclerosis and arterial embolism.

2.4 Isolated Central Vertigo

The only manifestation of posterior circulation ischemia is isolated central vertigo, which is mainly due to vestibular system pathology. The vestibular system is composed of the vestibular nerve, vestibular organ, vestibular nucleus, etc., and its function is mainly to feel the spatial movement of the body and head. Isolated vertigo can be manifested by lesions of the vestibular nerves at the cranial entry point, the cerebellar pontine lobule, and the nucleus of the vestibular nerves.

2.5 Others

Patient's gender, age, history of smoking and alcohol consumption and the patient can be predisposed to the disease if they have a history of medical conditions such as hypertension, hyperlipidemia, diabetes mellitus, cardiac disease, stroke, hyperhomocysteine, and vascular lesions [13].

3. Pathogenesis in Chinese Medicine

3.1 Vertigo Caused by Wind

According to Chinese medicine, one of the main etiological mechanisms of posterior circulation ischemic vertigo is that it is caused by wind. Wind is divided into external wind and internal wind in Chinese medicine, and the onset of this disease is mainly caused by internal wind, such as in "Suwen - Zhizhen Yao Da Lun", "all winds fall out of vertigo, all belong to the liver", which means that the liver yang transforms the wind into the main reason for the occurrence of vertigo [14]. Liver is a rigid organ, its nature is the main ascending and active, its function is to regulate the qi, liver yang excess or yin deficiency can not control the yang, there will be such as vertigo, convulsions, tremors and other characteristics of the disease. If liver yang is overactive and disturbs the clear orifices, vertigo will also occur. Therefore, it is believed that "no wind does not cause vertigo" [15].

3.2 Dizziness Caused by Fire

Chinese medicine believes that the liver belongs to wood, the lung belongs to gold, the lung fire is too much, then the gold can not restrain the wood, resulting in liver fire, wood and fire, fire is the yang evil, the nature of the active, so that the brain for the rotation [16]. Liu Wansu believes that the occurrence of vertigo is caused by internal wind and fire, which is mentioned in the "Suwen - Xuanji original disease style - five movement of the main disease chapter": "the so-called wind very much, and the head and eyes vertigo transport, by the wind and wood Wang, it must be that the gold can not control the wood, and the wood is born again, the wind and fire are all belonging to the yang, and more than for the concurrent, the

yang main in the movement, the two movement fight each other, then for the rotation of the [17]."

3.3 Vertigo Caused by Phlegm

There is another important pathologic factor in the development of vertigo, i.e. phlegm. There are clear explanations for its pathogenesis by various medical doctors. For example, Zhu Danxi emphasized that "if there is no phlegm, there will be no vertigo" and put forward the theory that phlegm and water cause vertigo" [18]; phlegm, which is not a person's original thing, can be caused by stagnation of qi and blood stasis for a long time, and phlegm and wetness are generated by the dysfunction of the transport and transformation of the body fluids. Ming Dynasty Qin Jingming said: "phlegm vertigo evidence, chest full of boredom, nausea and vomiting, prying water under the septum, vertigo palpitations more than, head and forehead for pain, this phlegm vertigo evidence also" [19]. It means that phlegm stops in the chest and diaphragm, which will cause the middle jiao Qing Yang does not rise, turbid yin does not descend, or phlegm clouding the clear orifices, meridian qi stagnation, medulla oblongata emptiness, the brain is not nourished, resulting in vertigo.

3.4 Dizziness Caused by Stasis

Yang Renzhai mentioned in "Renzhai Zhi Zhiqi Fang" that "stagnation and stagnation can cause dizziness." This means that stagnation of the meridians occurs, resulting in qi and blood not being able to glorify the head and eyes, and dizziness occurs when the head and eyes are not nourished. Yu Tuan pointed out in the "Medical Zhengzhuan - Vertigo Transportation" that: "There are people who have dizziness due to fall damage, and there is dead blood in the chest that is closed to the heart orifices, so it is appropriate to clear the blood to dissipate the stasis" [20]. That is to say, it is believed that the injury caused by the bumps and falls will lead to blood stasis, and the blood stasis will be gathered in the chest, blocking the heart orifices, leading to the loss of the heart and soul, resulting in dizziness. Read Medical Essay" mentioned: "Yin deficiency must be blood stagnation [21]", that is to say, Yin deficiency blood heat, fluid depletion, blood withered for a long time and stagnation, and blood stagnation can not be moistened on the head and eyes, appearing vertigo.

3.5 Dizziness Due to Deficiency

Vertigo first seen in the "Nei Jing", in the "Spiritual Pivot - mouth ask" put forward "on the gas is not enough, the brain for the dissatisfaction, the ear for the bitter ringing, the head for the bitter pouring, the eyes for the vertigo". Among them, qi deficiency leads to clear yang does not rise, qi and blood from the same source, qi deficiency is blood deficiency, qi deficiency is blood can not be up to the brain, and the brain is not moistened, ultimately leading to vertigo. In the "Jingyue quanquan" there is mentioned "vertigo an evidence, the virtual person in eight or nine, both fire and phlegm is only one of ten ears." Here, it is believed that vertigo is mainly caused by deficiency, with fire and phlegm at the same time. It shows the key position of the viewpoint of "vertigo caused by deficiency" in the etiology of vertigo [22].

Qiu Kaili et al. [23] believed that the pathogenesis of vertigo should be based on wind, and the treatment should be based on eliminating wind throughout the whole process, and should not be confined to the theory that liver wind causes vertigo, but should firstly identify the internal and external winds, and then identify the entrapment of phlegm and blood stasis, so as to combine the medicines and evidence in order to achieve the effect of the disease. Prof. Fang Xianming classified vertigo into acute attack and remission period. The former is mainly caused by wind-phlegm upheaval, wind is a yang evil and active, so it can cause vertigo. The latter is referred to as “posterior circulation ischemic vertigo”, which is mainly caused by phlegm and blood stasis blocking the collaterals, and Qi and blood not being able to pass through the collaterals [24]. Prof. Wang Jian believes that this disease is “blamed on the liver, labeled with phlegm, and originated in the kidney”, and based on his rich clinical experience, he found that this disease is closely related to hyperactivity of liver yang, and the obstruction of phlegm-dampness in the middle of the body and the failure of rising of clear yang, in addition to the hyperactivity of liver yang, which carries phlegm upward to obstruct and block the Qing orifices, and the liver and the kidney are out of the same phase of fire, and the insufficiency of the liver yin, and the involvement of the kidney yin and the water does not cover the wood. The lack of liver yin will affect the water of kidney yin, which does not contain wood. Dizziness is caused by the hyperactivity of liver yang, and can also be caused by the insufficiency of the medulla oblongata and the loss of nourishment of the brain orifices [25].

4. Western Medical Treatment

4.1 Vasodilation

The representative drug of vasodilator is vincristine, which can effectively block the adrenergic receptor pathway, so as to improve the cerebral ischemia, and improve the hemodynamics of the patients by increasing the supply of oxygen, so as to shorten the treatment time. Some scholars [26] used vincristine combined with conventional drugs to treat patients with diseases related to ischemia in the posterior circulation, which can effectively improve the clinical symptoms of the patients, and the therapeutic efficiency is more than 90%.

4.2 Thrombolytic Therapy

Thrombolytic therapy is mainly used for patients with posterior circulation ischemic stroke. This treatment can promote the patients' occluded blood vessels to be unblocked, so as to restore the blood oxygen supply to the infarcted area. Moreover, arterial thrombolytic therapy can improve the ability to fully utilize the effective time window, so as to rapidly control the patient's condition [27]. Some studies have shown [28] that arterial thrombolysis in patients with acute cerebral infarction in the posterior circulation is more effective than intravenous thrombolysis, and can effectively improve the prognosis of patients. It is necessary to comprehensively assess the patient's condition and select a more suitable method.

4.3 Endovascular Treatment

Endovascular therapy is mainly stenting and thrombus aspiration. It is usually applied to treat patients with stroke related to posterior circulation ischemia, and endovascular treatment can significantly improve the problem of posterior circulation ischemia, and with the popularization of this technology and the innovation of related surgical instruments, the success rate and prognosis of the operation have been significantly improved [29].

4.4 Ultrasound Therapy

Ultrasound treatment of posterior circulation ischemic vertigo is usually used in combination with drugs, which can effectively regulate the diastolic function of vascular endothelial cells, and then increase the cerebral blood flow in the posterior circulation.

5. Traditional Chinese Medicine (TCM) Treatment

5.1 Treating Vertigo from Wind

The basis of Chinese medicine treatment for vertigo is to treat wind. Clinically, most of the drugs are used to suppress the liver and relieve wind, but the liver wind can also become fire, and the fire can be accompanied by phlegm and blood stasis. Therefore, the treatment should be based on the specific etiology and mechanism of the disease, dialectic treatment. If blood stasis obstructs the channels, causing wind to enter the channels and disturbing the clear orifices, resulting in dizziness, the treatment should be based on removing blood stasis and clearing the channels, and evacuating wind-heat; if the cause is due to the prevalence of Yang in the factor body and the hyperactivity of Liver-Yang, the treatment should be based on clearing and draining the Liver meridian, calming the Liver and subduing the Liver-Yang; if the Yin is not controlling the Yang because of Yin deficiency or blood deficiency, or if the phlegm is blocking the meridian and the Phlegm follows the movement of wind, resulting in the blockage of Phlegm and the Brain, which ultimately results in dizziness, the treatment should be based on removing Phlegm, dispelling dampness, calming the Liver, and eliminating the dampness of Phlegm. Resolving phlegm and dispelling dampness, calming the liver and submerging yang, strengthening the spleen and harmonizing the stomach should be the mainstay of treatment [30].

5.2 Treating Dizziness from Fire

Fire is a yang evil, easy to consume qi and hurt yin, resulting in loss of nourishment of the orifices, and liver depression and fire cause fluid depletion, blood withered for a long time and accumulation of blood stasis, can not be moistened on the head and eyes, resulting in dizziness [31], some scholars [32] believe that the treatment should be guided by the theory of phasic fire, from the liver, spleen and kidney viscera to start the identification of treatment, in order to obtain good results.

5.3 Treatment of Dizziness from Phlegm

It is mentioned in “Suwen - Jingwei Bie Lun” that the production of phlegm is closely related to the operation of water distribution, “Drinking in the stomach, overflowing

essence, upward transmission in the spleen, spleen qi disperses essence, upward return to the lungs, through the adjustment of the water channel, downward transmission of the bladder, the four distribution of the water essence, the five meridians in parallel, “ indicating that phlegm is produced by the lungs, the spleen and the kidneys, but because phlegm is often accompanied by the symptoms of depression, stagnation, heat and dampness, each symptom interacts with each other, and the treatment of phlegm can only be effective. However, as phlegm is often accompanied by symptoms such as depression, stasis, heat and dampness, the symptoms can be transformed into each other. Therefore, when treating patients with phlegm-induced dizziness, the cause should be examined and the treatment should be evidence-based. Some scholars of traditional Chinese medicine [33] totaled the types of patients with vertigo caused by phlegm according to the nature of phlegm, etiology and pathogenesis, including hot phlegm, cold phlegm, phlegm stasis, and phlegm-dampness, and adopted the therapies of treating heat with cold, treating cold with heat, transforming stasis, and treating dampness with dryness to treat the symptoms, respectively. Some doctors [34] believe that “liver is the hub of phlegm”, liver is the organ of wind and wood, liver is a rigid organ, upward disturbance of the clear orifices, phlegm and turbidity in the obstruction, which will lead to the rise of phlegm in the liver wind, resulting in phlegm blockage of the brain and the clear orifices are blocked, and vertigo occurs, the clinic adopted the wind-dizzling formula with the efficacy of wind-extinguishing and phlegm-eliminating, activating the blood and clearing the orifices, and promoting the yang to open the orifices, combined with the treatment of western drugs, and found that this method can effectively improve the clinical symptoms of patients, and the clinical symptoms can be improved. It was found that this method could effectively improve the clinical symptoms of patients and increase the blood flow rate of vertebral basilar artery.

5.4 Treating Dizziness from Blood Stasis

Since vertigo caused by blood stasis belongs to the real evidence, and blood stasis is easy to consume essence and blood over a long period of time, resulting in a mixture of deficiency and reality, and both deficiency and reality can lead to blood stasis, therefore, when treating vertigo with blood stasis, we should differentiate between deficiency and reality, and the basic principle of treatment is to activate blood circulation and eliminate blood stasis. Clinical scholars have summarized the different types and experiences of treating vertigo from stasis [35]. Liu Aihua et al [36] used Astragalus Red Wind Soup combined with tonifying the middle and benefiting qi soup to treat patients with qi deficiency and blood stasis type of posterior circulation ischemic vertigo on the basis of conventional treatment, which can effectively improve the patients' bilateral vertebral artery and basilar artery blood flow velocity.

5.5 Treating Vertigo from Deficiency

The main types of deficiency are such as deficiency of kidney essence, deficiency of qi and blood, deficiency of clear yang, deficiency of yin and hyperactivity of yang, etc., which can also appear separately or intermingled, and the clinical use of medication should pay attention to the overall consideration to

avoid losing one or the other [37]. Some scholars [38] that spleen and kidney deficiency type posterior circulation ischemic vertigo patients can be used to benefit the kidney and spleen method of treatment, spleen and stomach weakness type vertigo patients can be used to replenish qi and blood method of treatment. Guangfeng Qi et al [39] used Yiqi and clever soup combined with western medicines to treat patients with qi and blood deficiency type of recovery-phase posterior circulation ischemic vertigo, and found that it could effectively improve the mean blood flow velocity and pulsatility index of the left and right vertebral arteries and basilar artery of the patients.

5.6 Acupuncture Treatment

Acupuncture and moxibustion is a traditional Chinese medicine external therapy, which has a long history in the treatment of various vertigo diseases. According to Chinese medicine, treating posterior circulation ischemic vertigo with acupuncture can dredge the meridians and adjust qi and blood. Modern medical research [40] has shown that acupuncture can promote cholinergic sympathetic and non-cholinergic, non-adrenergic nerve excitation, dilate blood vessels, increase cerebral blood flow, and then alleviate patients' clinical symptoms. The commonly used needling methods include warm acupuncture, head acupuncture and body acupuncture. Among them, warm acupuncture and moxibustion can relieve the compression of the vertebral artery caused by the surrounding soft tissues through the generation of warmth and heat, as well as the effect of needling to relieve the spasm of the vertebral artery, so as to improve the blood supply of the vertebrobasilar artery, and ultimately make the patients with ischemic vertigo in the posterior circulation to alleviate the clinical symptoms or disappear. Some scholars have found that [41], compared with conventional acupuncture, warm acupuncture is more effective in improving the blood supply of vertebrobasilar artery in patients with posterior circulation ischemic vertigo. The effects of head acupuncture include popularizing qi and blood and dredging meridians. Head acupuncture can promote blood circulation, regulate neuromuscular excitability, and improve nerve conduction. The most commonly used acupuncture therapy is body acupuncture, which mainly refers to the acupuncture therapy performed on the meridians and acupoints of various parts of the body. In a study [42], patients with posterior circulation ischemic vertigo were treated with acupuncture therapy and oral nimodipine, and the total effective rate of the acupuncture group was more than 90%, which was significantly higher than that of the control group.

6. Summary

Currently, there are various treatments for posterior circulation ischemic vertigo, and appropriate treatments should be selected according to the specific conditions of patients. In addition, preventing the occurrence of posterior circulation ischemia is also very important, and active measures should be taken for prevention. Posterior circulation ischemic vertigo is a common neurological disorder with a complex pathogenesis and a current state of treatment that is constantly evolving and improving. Understanding the pathogenesis of posterior circulation ischemic vertigo and the current status of treatment is of great significance for clinical

diagnosis and treatment. At the same time, prevention of posterior circulation ischemia is also very important, and active measures should be taken for prevention.

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