

Overview of etiology and pathogenesis of cerebral arteriosclerotic vertigo and research progress in the treatment of traditional Chinese medicine

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Abstract: Nowadays, the incidence of cerebral arteriosclerosis is increasing year by year, and vertigo is the most common concomitant symptom, which seriously affects the quality of life of patients. A number of clinical studies have confirmed that TCM treatment of cerebral arteriosclerosis has the characteristic of high efficiency, short course of treatment and low adverse reactions. This paper mainly summarizes the etiology and pathogenesis arteriosclerotic vertigo and reviews the relevant research progress of TCM in the treatment of arteriosclerotic vertigo in the past decade, and presents personal outlook and insights on the future treatment of cerebral arteriosclerosis by TCM.

Keywords: Cerebral Arteriosclerosis; Vertigo; Etiology and Pathogenesis; Traditional Chinese Medicine Treatment; Research Progress

1. Introduction

Cerebral arteriosclerosis refers to a variety of pathological changes such as arterial intima thickening, plaque formation, lumen narrowing, small-vessel occlusion, vascular elasticity weakened and roughness of the vessel wall caused by various reasons, eventually leading to cerebral atherosclerosis, artery wall degeneration, eventually causing brain tissues in a state of chronic ischemia hypoxia for a long time, with headache, dizziness, insomnia, memory loss as the main clinical manifestations. It belongs to the category of "vertigo", "headache" and "dementia" in TCM[1,2,3]. Cerebral arteriosclerosis is a common and frequent disease in middle-aged and elderly groups, with a prevalent of more than 90% [4], of which vertigo is the most common symptom[5]. Cerebral arteriosclerotic vertigo can progress to stroke, dementia, etc., Western medicine treatment with hypolipidemic, vasodilator, antiplatelet as the main treatment, drugs mostly choose atorvastatin calcium tablets, aspirin, but long-term use is prone to drug resistance and adverse reactions[6]. In recent years, TCM has made new progress in the prevention and treatment of arteriosclerosis vertigo. A number of studies and experiences of famous veteran Chinese medicine practitioners have pointed out that the use of traditional Chinese medicine in the treatment of cerebral arteriosclerotic vertigo is superior to western medicine alone.

2. Etiology and pathogenesis

There is no name of "cerebral arteriosclerotic vertigo" in Chinese medicine, but it belongs to the category of "vertigo" in Chinese medicine because of its main symptom of "vertigo". Its etiology and pathogenesis are mainly based on the lack of nourishment for the brain due to liver and kidney deficiency, irregular diet, mutual obstruction of phlegm and stagnation, emotional and mental disorders, and imbalance of yin and yang.

2.1 Insufficiency of liver and kidney, loss of nourishment of brain marrow

"Lingshu· Hai Lun" records that "brain for the medullary sea", "Insufficient medulla oblongata will lead to cerebral tinnitus, tibial acidity and vertigo.", the disease often occurs frequently in middle-aged and the elder, who are physiologically deficient in internal organs, liver and kidney essence and blood, kidney marrow, brain marrow losses nutrition, then develops vertigo; It is written in the

"Suwen Xuanji Original Disease Style - Five Transport Main Disease": "The so-called wind is very, the head and eyes dizzy transport, caused by the wind and wood flourishing, while the wood regenerates the fire, wind and fire are Yang, Yang main movement ,then for the rotation.",The old are weak and physical deficiency, liver and kidney are Yin liquid insufficiency, liver belongs to wood, wood produces wind, liver is a Zang organ that features wood ,wood passes through in liver, liver disease can generate wind, liver Yin is insufficient, water (kidney) failing to nourish wood (liver), Yang can be easily hyperactive and developing into wind, wind and Yang move inside, so patients feel dizzy. It can be seen that dizziness can occur when the liver and kidney are deficient in essence and blood and the brain marrow is not nourished, or when the liver and kidney are deficient in yin and essence and the liver is hyperactive in yang.

2.2. Improper diet, phlegm and blood stasis binding together

The spleen and stomach are the basis of the latter and the source of qi and blood. It's greasy and difficult to melt and easy to damage the spleen and stomach for the people who like fat and sweet taste, for making the spleen and stomach movement disorder, causing to lose control of transportation and transformation, if spleen fails to transport, water will metabolism disordered, internal fluid becomes into phlegm turbidity, "no phlegm without dizziness". Phlegm is a substance which easily resists the movement of qi, then phlegm stagnates, qi rises and falls disorderly, Qingyang does not rise and cause vertigo. Sputum turbidity stagnates internally for a long time and gathers into fire, phlegm fire internal movement also leads to vertigo; If spleen and stomach are weak that will aggravate the insufficiency of Qi and blood, meanwhile, deficiency of Qi and blood will lead to weak propulsion and obstruction of water flow, which will aggravate phlegm. The weakness of Qi and blood flow will easily lead to internal stasis of blood in the veins, and phlegm and stasis can both be separate diseases and interact with each other, phlegm and stasis can obstruct the flow of Qi and blood. "Jing Yue Quan Shu - Dizziness": "No deficiency does not make dizziness", the spleen and stomach do not have enough qi and blood to transform the source, the pulse channel will be empty, brain will loss nutrition, phlegm and blood will stasis, the qi and blood is blocked,then people will be attacked by vertigo.

2.3. Emotional and mental disorders, disharmony between Yin and Yang

Yang qi is strong, hyperactive liver Yang ascending. Or because of emotional distress ,qi gathers into fire,fire is flourishing to injury Yin and liver wind is stirring inside, then disturbing Qingqiao, all can be taken bad vertigo."LeiZhengZhiCai- Dizziness"says: "The ears and eyes are the clear and empty orifices, the wind and the sun are boiling, so dizziness is made. The liver and gallbladder are the organs of wind and wood, and the phase fire is sent inside, and its nature is active and ascending. It may be due to physical and mental over-activity, or to emotional depression. Or from old age and kidney failure, water does not contain wood to dizziness of the eyes and tinnitus, and vertigo"[7]. The patients are old and weak of liver and kidney deficiency, Yang hyperactivity due to Yin deficiency, whenever there is emotional disorder, which can aggravate dizziness by directing troubles. Depression and anger injure the liver, and the liver loses its relaxation and discharge, so that the qi becomes unregulated and the depression turns into fire, which leads to hyperactivity of the liver and yang and internal movement of wind and yang, resulting in vertigo.

Professor Hong Zhiping, a state-level famous veteran Chinese medicine practitioner, believes that the pathogenesis of cerebral arteriosclerotic vertigo is based on deficiency of the liver and kidney and deficiency of the essence, with phlegm and blood stasis as the symptoms, and blood stasis, phlegm and blood stasis are the main pathogenic factors [8]. In summary, the disease is based on deficiency of liver and kidney and deficiency of qi and blood, among which liver and kidney deficiency is most common, phlegm and blood stasis are the main pathological factors. Treatment is based on tonifying the liver and kidney, pacifying the liver and yang, strengthening the spleen and stomach, tonifying the qi and blood, resolving blood stasis, cleansing phlegm and dispersing nodules.

3. Dialectical typing

Cerebral arteriosclerotic vertigo belongs to deficient root and excessive branch and the causative factors are mostly phlegm, stasis and deficiency.Qiu Haili [9] and others identified it as a deficiency of kidney essence and empty medulla oblongata, a deficiency of middle energy and weakness of qi and blood, a deficiency of heart and spleen and phlegm-dampness obstruction, and a deficiency of liver and kidney yin and hyperactivity of liver-yang,type of disease. The clinical dialectical classification of

clinical researchers were liver-yang hyperactivity syndrome, qi and blood deficiency syndrome, kidney essence deficiency syndrome, phlegm-dampness syndrome, and blood stasis syndrome, which were treated with nourishing yin and subsiding yang, tonifying blood and nourishing blood, invigorating spleen and supplementing qi, tonifying kidney essence, invigorating spleen and mediate middle-Jiao, eliminating dampness and phlegm, promoting blood circulation to remove blood stasis, and dredging collaterals and penetrating orifices, respectively, then the symptoms of cerebral blood flow, blood lipids, and vascular stasis had been significantly improved [10.11.12]. Zhu Meiju et al. [13] found that the dialectical blood stasis syndrome of the disease was associated with increased serum TNF- α content, and the kidney deficiency syndrome was associated with decreased serum NO level by detecting the serum TNF- α and NO levels in patients with cerebral arteriosclerotic vertigo, effectively combining dialectication with laboratory tests.

4. Chinese medicine treatment

4.1. Single herbs

Zhang Yan [14] analysis Yang Zhihong chief physician's treatment of cerebral arteriosclerotic vertigo with 329 prescriptions, found that the frequency of use > 200 times of drugs are *Gastrodia elata*, *Chuanxiong*, *Poria cocos*, *Uncaria rhynchophylla*, Kudzu root; *Gastrodia elata*, *Chuanxiong* used the most. *Gastrodia elata* Blume has the effects of rest wind and antispasmodic, calming liver-yang, expelling wind and dredging collaterals, and its main components are gastrodin, gastrodin aglycone, gastrodin phenols, etc. Gastrodin has the effects of improving arterial insufficiency, dilating cerebral vessels, increasing cerebral blood flow, and protecting nerve cells, and can rapidly penetrate the blood-brain barrier into the brain to play a role. Gastrodin aglycone is a metabolite of gastrodin in the body, which is easier to pass through the blood-brain barrier and easily absorb in the intestine to relieve lipid deposition in cardiovascular and cerebrovascular diseases and slow down atherosclerosis. *Gastrodia* phenols have good anticoagulant effects [15]. *Chuanxiong*, which goes up to the top of the pinnacle and down to the sea of blood, is a qi medicine in the blood, and is mainly used in the treatment of cerebrovascular diseases to activate blood circulation, remove blood stasis, move qi and relieve pain. The main component of *Chuanxiong* is ligustrazine, which has the effects of lowering blood lipid, anti-atherosclerosis and anticoagulation and anti-platelet [16]. Ligustrazine can promote the penetration of drugs through the blood-brain barrier by inhibiting the expression of efflux protein P-gp, increase the bioavailability of gastrodin in vivo, promote the distribution of gastrodin to the brain tissue, and slow down the elimination rate, so the compatibility of *Chuanxiong* with *Gastrodia elata* not only can play their own efficacy, but also can enhance the drug utilization and efficacy [17].

4.2. Classical prescriptions

The use of classical Chinese medicine prescription in the treatment of cerebral arteriosclerotic vertigo has the characteristics of high efficacy, less adverse reactions and low recurrence rate. Qiu Haili [9] and others treat cerebral arteriosclerotic vertigo with dialectical typing, divide into five types, kidney essence deficiency and empty medulla, the treatment was to fill the essence and nourish the medulla to enrich the brain, and for kidney yin deficiency, Zuo Gui Wan with addition and subtraction, and for kidney yang deficiency, Right Gui Wan with addition and subtraction. For deficiency of qi and blood were treated with tonifying qi, nourishing blood and benefiting brain, and Bazhen Decoction was given. For deficiency of both heart and spleen, phlegm-dampness resistance, the treatment was to invigorate the spleen and nourish the heart, and dissolve phlegm and dampness, then gived Guipi Decoction and Banxia Baizhu Tianma Decoction. Liver and kidney yin deficiency, liver yang hyperactivity, the treatment was nourishing the liver and kidney, to Qiju Dihuang Pill and Tianma Gouteng Decoction addition and subtraction. In cases of Qi deficiency and blood stasis, the treatment was activating blood to resolve stasis, invigorating Qi and dredging collaterals, giving Tongqiao Huoxue Decoction. After treatment, the total effective rate of TCM treatment group was 93.94%, the recurrence rate was 3.33%, without adverse reactions, while the effective rate of control group (cinepazide maleate) was 72.73%, the incidence of adverse reactions was 23.33%, the recurrence rate was 26.67%. Wang Shihe [12] identified the symptoms as hyperactivity of liver and yang, deficiency of qi and blood, deficiency of kidney essence, phlegm and dampness, and obstruction of blood stasis, and were given Tianma Gouteng Decoction, Guipi Decoction, Dihuang Yinzi, Banxia Baizhu Tianma Decoction, and Tongqiao Huoxue Decoction, respectively, with good clinical efficacy at last.

4.3. Empirical formula

Professor Hong Zhiping made Tongnao Ruanmai Yin (Radix Rehmanniae Praeparata, Fructus Lycii, Radix Polygoni Multiflori, Cornus Officinalis, Cassia Obtusifolia, Chrysanthemum morifolium, Fructus viticis, Salvia miltiorrhiza, Chuanxiong, Radix Paeoniae Rubra, Rhizoma Orange, Trichosanthes kirilowii Maxim, Tianzhu Huang, Acorus calamus, Kudzu root) to treat cerebral arteriosclerotic vertigo of liver and kidney deficiency and phlegm-turbid blood stasis type [8]. Hu Xianrong [18] and others self-made Huoxue Huatan Yiqi Jianpi Bushen Decoction (Radix Astragali, Radix Puerariae, Rhizoma Atractylodis Macrocephalae, Radix Paeoniae Rubra, Rhizoma Polygonati, Herba Epimedii, Acorus calamus, Poria cocos, Bombyx mori, Rhizoma Pinelliae, and Radix Scorpio) in order to regulate spleen and kidney, dissolve phlegm and invigorate qi, achieve the purpose of lowering blood lipid and anticoagulation phlegm and improving cerebral blood flow and microcirculation in patients with cerebral arteriosclerotic vertigo. In addition, the clinical dialectical to self-made formula, phlegm-dampness in the body was to Zexie Dingxuan Decoction, Yin deficiency and Yang excess was given Gouma Zhenxuan Decoction, Qi deficiency and blood stasis was given Shenqi Zhixuan Decoction, the overall response rate of 97.78% [19].

4.4. Chinese patent medicine

Li Hanmei [20] randomly divided 90 patients with cerebral arteriosclerotic vertigo into two groups and treated them with Xuesaitong soft capsules and Ginkgo biloba ketone ester dripping pills for promoting blood circulation and removing blood stasis and activating blood vessels, respectively. After treatment, the effective rates of the two were 91.11% and 93.34%, respectively ($P < 0.05$). It was found that both of them could effectively treat cerebral arteriosclerotic vertigo, but Ginkgo ketone ester dripping pills had better efficacy. Shen Yanfang [21] and other relevant literatures suggested that blood stasis is an important cause of vertigo. Ginkgo biloba leaves have the effects of promoting blood circulation and removing blood stasis, dredging collaterals and relieving pain, removing turbidity and lowering lipid in the treatment of cerebrovascular diseases. Ginkgo biloba extract dripping pills can improve vertigo symptoms through anti-platelet and improving blood viscosity. Ginkgo biloba ketone ester dripping pills and Naoxinqing tablets were used as controls to find that ginkgo biloba ketone ester dripping pills had better efficacy. Homocysteine (Hcy) has been studied to accelerate the progression of arteriosclerosis and is an independent risk factor for cerebral arteriosclerosis. The level of Hcy is closely related to the occurrence and development of cerebral arteriosclerosis [22]. Wang Jijuan [23] and others confirmed by clinical observation that Ginkgo biloba ketone ester dripping pills can effectively relieve the symptoms of cerebral arteriosclerotic vertigo and reduce the level of homocysteine. Vertigo tablets have the effects of invigorating the spleen and dampness, nourishing the liver and tonifying the kidney, and regulating qi. Wei Liang [24] used vertigo tablets as the treatment group to treat cerebral arteriosclerotic vertigo. After treatment, the overall response rate of the experimental group was significantly higher than that of the reference group (flunarizine) (95.56% > 75.56%), and the incidence of adverse reactions was also lower than that of the reference group (4.44% < 22.22%), $P < 0.05$. It can be seen that Chinese patent medicine treatment of cerebral arteriosclerotic vertigo has high efficacy, less adverse reactions, can improve the characteristics of blood vessels. Compared with some Chinese patent medicines, Ginkgo biloba extract dripping pills are more effective in relieving cerebral arteriosclerotic vertigo.

4.5. Acupuncture therapy

Wang Bin [25] and others treated patients with cerebral arteriosclerotic vertigo by acupuncture (main points: bilateral Neiguan, Renzhong, Sanyinjiao, auxiliary points: Chize, Jiquan, Weizhong), and the control group was given conventional western medicine, and it was found that the overall response rate and neurological function and life index scores of the observation group were significantly better than those of the control group ($P < 0.05$). Xu Ying [26] according to the effect of tonifying vital energy, dissipating heat and hygroscopolamine and vitamin B6 injection at Fengfu point on the basis of conventional western medicine, found that it could reduce low shear whole blood viscosity, plasma viscosity and erythrocyte aggregation index, effectively improve hemorheology, and relieve symptoms.

4.6. Integrated traditional Chinese and western medicine therapy

Li Dongyan [27] treated patients with cerebral arteriosclerotic vertigo with conventional western medicine combined with Xuefu Zhuyu Decoction plus add or subtract promoting blood circulation to

remove blood stasis and regulating menstruation and dredging collaterals, with an effective rate as high as 100%, while the control group (conventional western medicine) was only 30% ($P < 0.05$). Qiangli Dingxuan Tablets are commonly used in clinical practice to treat hypertension, vertigo, headache and other diseases. Yang Dongfeng [28] et al. used Qiangli Dingxuan Tablets to extinguish wind and tonify deficiency, replenish qi and promote blood circulation to treat cerebral arteriosclerotic vertigo by oral administration of Qiangli Dingxuan Tablets combined with Flunarizine to improve cerebral blood flow and relieve vertigo symptoms. Yang Qian [29] et al. concluded that the key to the treatment of cerebral arteriosclerotic vertigo lies in promoting blood circulation and removing blood stasis, dispelling meridians and dredging collaterals, tonifying deficiency and purging excess according to etiopathogenesis and pathogenesis analysis, Qiangli Dingxuan Tablets have the effect of inhibiting platelet aggregation, preventing thrombosis and effectively preventing the progression of cerebral arteriosclerosis. Shang Jianhua [30] took oral flunarizine hydrochloride capsules as the control group, and the observation group added Yangxueqingnao Granules with the effects of nourishing blood and activating blood circulation, calming liver and dredging collaterals on the basis of the control group. After treatment, it was found that the effective rate of the control group was 73.46%, which was significantly lower than that of the treatment group (95.91%), $P < 0.05$. It was found that Yangxueqingnao Granules could effectively improve the cerebrovascular blood flow velocity and pulsatility index of the vertebral artery and basilar artery. Clinical observation confirmed that Xuesaitong combined with Flunarizine in the treatment of cerebral arteriosclerotic dizziness can effectively improve hemorheology and relieve symptoms. Because flunarizine dilates blood vessels, increases blood flow, and promotes the oxygen supply capacity of brain cells; Xuesaitong improves hemodynamics, resists thrombosis, and improves the scavenging capacity of oxygen free radicals to protect brain tissue [31].

Acanthopanax senticosus injection has the effects of tonifying liver and kidney, benefiting essence and strengthening bone, promoting blood circulation and dredging collaterals, reducing blood viscosity, dilating blood vessels, promoting blood circulation, and increasing cerebral blood flow. Combined treatment with Acanthopanax senticosus and Flunarizine can significantly improve the quality of life of patients with cerebral arteriosclerotic vertigo [32]. Tang Kun [33] believes that cerebral arteriosclerotic vertigo is mostly caused by deficiency of qi and blood, and should be based on supplementing qi and nourishing blood in the treatment, so Guipi Decoction combined with conventional western medicine is used to treat cerebral arteriosclerotic vertigo patients with deficiency of both qi and blood to tonify qi and blood, elevate Qingyang, and strengthen the spleen and stomach. Song Xuan [34] and others dialectically treated cerebral arteriosclerotic vertigo by the combination of traditional Chinese and western medicine, phlegm obstruction and blood stasis type to self-made Tiaozhi Roumai Fang (Radix Polygoni Multiflori, Rhizoma Alismatis, Semen Cassiae, Fructus Crataegi, Glossy Ganoderma, Radices Trichosanthis, Radix Salviae Miltiorrhizae, Radix Astragali, Rhizoma Polygonati, Rhizoma Atractylodis, Radix Dragon, Rhubarb) to invigorate spleen and kidney, promote blood circulation, invigorating spleen and tonifying kidney, promoting blood circulation and dredge collaterals, clear away heat and remove blood stasis, eliminate phlegm and remove turbidity; the patient's symptoms were significantly improved after syndrome differentiation treatment.

5. Summaries and prospects

With the aging of the population, changes in dietary habits and living habits, cerebral arteriosclerotic vertigo has become a common and frequently-occurring disease in middle-aged and elderly groups. Cerebral arteriosclerotic vertigo focuses on prevention, to strict low-salt and low-fat diet, strict control of blood pressure, blood glucose, smoking cessation and alcohol withdrawal, while appropriate exercise. Although Chinese medicine has made gratifying progress in the treatment of cerebral arteriosclerotic vertigo, there is still a lack of authoritative diagnosis and treatment standards for its dialectical classification and selected prescription medication in traditional Chinese medicine, and there is still a lack of high-quality literature data, lack of authoritative experimental research and clinical research to guide treatment, and there is still no reliable theoretical basis. Therefore, it is urgent to develop effective diagnosis and treatment standards and carry out high-quality experimental and clinical studies.

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