

Research Progress of Traditional Chinese Medicine in the Treatment of Hypertension

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How to cite this paper: Xuan Hao, Junru Zhang. (2021) Research Progress of Traditional Chinese Medicine in the Treatment of Hypertension. *International Journal of Clinical and Experimental Medicine Research*, 5(4), 451-456.
DOI: 10.26855/ijcemr.2021.10.005

Received: August 6, 2021

Accepted: August 30, 2021

Published: September 18, 2021

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Abstract

As one of the diseases with the highest incidence of chronic diseases in China, hypertension has an important impact on the living standards of our people. The mortality rate of complications caused by hypertension is also increasing year by year, mainly the damage to the heart, brain, kidney and other important target organs, and its occurrence and development is related to a variety of factors. Many risk factors are also the initiators of its development and progress. The treatment of hypertension is not only to reduce blood pressure, but also to prevent and intervene the impact of its risk factors on the human body. In recent years, with the deepening of research, the antihypertensive mechanism of some traditional Chinese medicine has been gradually discovered, which provides effective evidence for the treatment of hypertension with traditional Chinese medicine. To make traditional Chinese medicine more targeted and safe, this paper will elaborate on syndrome type analysis, syndrome treatment, target organ damage and traditional Chinese medicine in renin angiotensin aldosterone system (RAAS), inhibition of sympathetic nerve activity, inhibition of vascular remodeling, effect of calcium antagonist, improvement of insulin resistance, diuresis and so on.

Keywords

High Blood Pressure, Traditional Chinese Medicine, Hypotension Mechanism

Hypertension is the main clinical manifestation of increased systemic arterial pressure caused by various factors [1]. Hypertension is one of the diseases with the highest incidence of chronic diseases in China, which is often accompanied by abnormal metabolism of blood lipids, blood sugar, homocysteine, uric acid and so on. With the progress of hypertension, it gradually damages the heart, brain, kidney and other important organs. At present, the principles for the treatment of hypertension are improving lifestyle, reducing risk factors and drug control. The prevention and treatment of hypertension Brooks no delay. Traditional Chinese medicine classifies hypertension as "headache", "dizziness" and "wind dizziness". The treatment of hypertension with traditional Chinese medicine can not only reduce blood pressure, but also has significant advantages in improving symptoms and quality of life. In the treatment of hypertension, traditional Chinese medicine pays attention to the relationship among body, disease syndrome and medicine, pays attention to the whole concept, and adopts the thinking method of syndrome differentiation and treatment to treat diseases, so as to make the human body reach the state of "Yin Pingyang secret". In the treatment of diseases in traditional Chinese medicine, we should follow the "method from syndrome and prescription from method". For any disease, it is necessary to use drugs based on syndrome differentiation and realize individualized treatment in clinic. Pay attention to the overall concept, establish the concept of whole-course intervention in the treatment of hypertension, and reduce the incidence of complications, disability and mortality as

much as possible.

1. Analysis of Syndrome types of Hypertension

There are many causes of hypertension, and its pathogenesis is more complex, which leads to the syndrome type of hypertension has not been completely unified. However, with the increase of research in recent years, the syndrome types of hypertension tend to be consistent. In the consensus of TCM experts on diagnosis and treatment of hypertension, hypertension is divided into four syndrome types: hyperactivity of liver yang, internal stagnation of phlegm, deficiency of kidney yin and internal stagnation of blood stasis [2]. According to the study on the correlation between physique and symptoms of 200 patients with hypertension, Li Jing found that the constitution of patients with hypertension was characterized by phlegm-dampness and qi depression, which were considered to be susceptible to hypertension, and the syndrome type of phlegm-dampness was the most common. The quality of phlegm-dampness is positively correlated with phlegm-dampness syndrome, phlegm-blood stasis syndrome and internal obstruction of phlegm-heat syndrome [3]. According to the study on the distribution of TCM syndrome types and blood pressure variability of 443 cases of senile hypertension, Lu Cheng et al. found that yang-qi deficiency was the most common in the older age, and the course of disease was longer, while the age of hyperactivity of liver-yang was the youngest and the course of disease was short. Through the study of the law of blood pressure variability, it was found that the systolic blood pressure variability was the highest in patients with liver-kidney yin deficiency syndrome and the lowest in patients with deficiency of both qi and yin [4]. Academician Tong Xiaolin divides hypertension into “six states”, namely, choking state, cold state, depression state, water state, deficiency state and leathery state, and speculates the prognosis and development of hypertension through different “states” in order to achieve prevention in advance, so as to delay or block the progression of the disease [5].

2. Syndrome type treatment of hypertension

According to different syndrome types, traditional Chinese medicine prescription for the treatment of hypertension is a common treatment of traditional Chinese medicine in the treatment of hypertension. In the classic syndrome of hyperactivity of liver-yang in vertigo, Tianma Gouteng decoction was used to calm the liver and extinguish wind and tonify the liver and kidney; in the syndrome of phlegm-dampness, Banxia Baizhu Tianma decoction was used to dispel phlegm and extinguish wind, invigorate spleen and remove dampness; blood stasis blocking syndrome, Tongqiao Huoxue decoction was used to activate blood circulation and remove blood stasis, dredge pain; deficiency of qi and blood was used to replenish qi and replenish blood, invigorate spleen and nourish heart; kidney yin deficiency, Zuogui pills were used to nourish liver and kidney, fill essence and benefit marrow [6]. Traditional Chinese medicine does not stick to one side in the treatment of diseases, and adopts different prescriptions for the same disease, that is, “different treatments for the same disease”. For hypertension with yin deficiency and yang hyperactivity syndrome, Ding Kang and others were treated with Qianyang Yuyin granule combined with western medicine. It was found that it could reduce the rate of blood pressure variation, reduce blood pressure load and reduce systolic blood pressure [7]. Song Yiqun and others applied modified Qiju Dihuang decoction combined with western medicine to treat hypertension of yin deficiency and yang hyperactivity syndrome. It was found that the compound was superior to simple western medicine in reducing blood pressure and improving TCM symptoms [8]. Wang Jiabin and others used Pinggan Ziyin Tongyu recipe combined with western medicine to treat hypertension with yin deficiency and yang hyperactivity syndrome, the result was the same as Song Yiqun [9]. As can be seen from the above studies, the treatment of hypertension with traditional Chinese medicine can not only effectively reduce blood pressure, but also reduce the symptoms of patients, thus improving the quality of life. The study found the therapeutic effect of traditional Chinese medicine by monitoring objective indicators. Gu Ping et al. found that Zhangan Xifeng decoction could regulate the metabolic level of hexadecanoic acid in hypertension with yin deficiency and yang hyperactivity syndrome [10]. Du Berong and others were treated with Liuwei Dihuang decoction combined with western medicine to treat hypertension of liver and kidney yin deficiency syndrome. The results showed that Liuwei Dihuang decoction could not only reduce blood pressure and improve symptoms, but also regulate lipid metabolism disorder, improve hemorheology and down-regulate inflammatory factors [11]. Wang Chunliang et al., Huangyinzi capsule combined with western medicine in the treatment of refractory hypertension with deficiency of both yin and yang can effectively improve clinical symptoms, increase the level of nitric oxide and reduce the level of endothelin. However, this study has not found that the antihypertensive effect of Dihuang Yinzi capsule is related to the level of neuroendocrine hormone [12]. Because of its complex and diverse components, the safety of traditional Chinese medicine is also the research direction in recent years. Zhao Ziming and others used compound Qima capsule combined with western medicine to treat hypertension with qi deficiency and

phlegm turbid syndrome. It was found that the liver and kidney function was in the normal range before and after treatment [13]. Wang Hongye and others combined Yiqi Huoxue decoction combined with balanced acupuncture and moxibustion combined with western medicine to treat hypertension with qi deficiency and blood stasis syndrome. No obvious adverse reactions were found in the course of treatment [14]. Jia Wei and others classify the antihypertensive drugs of western medicine individually through the thought of syndrome differentiation of traditional Chinese medicine, such as calcium antagonist poyidine has a better effect on hypertension of phlegm-dampness, while angiotensin II receptor antagonist irbesartan has a better effect on hypertension of hyperactivity of liver-yang [15], which provides a theoretical basis for the treatment of hypertension with traditional Chinese medicine combined with western medicine.

3. Treatment of target organ damage in hypertension

The common target organ damage of hypertension includes heart, kidney, brain, blood vessels, optic nerve and so on. In the early stage of heart damage, compensatory thickening of myocardial fibers leads to ventricular hypertrophy, especially left ventricular hypertrophy. Jie Jing et al. studied the relationship between TCM syndrome and left ventricular configuration in 133 patients with hypertension. It was found that the thickness of interventricular septum in patients with deficiency of both yin and yang was significantly increased, while the thickness of interventricular septum in patients with hyperactivity of liver fire was the lowest [16]. Luo Shihua et al. used TCM syndrome differentiation combined with western medicine to treat hypertensive left ventricular hypertrophy, and found that TCM syndrome differentiation combined with western medicine or only traditional Chinese medicine to reverse left ventricular hypertrophy was superior to simple western medicine group [17]. Cui Xiaoyun et al. used Bushen Jiangya recipe to treat hypertension with left ventricular diastolic dysfunction and found that it could effectively reduce the index of left ventricular diastolic function (E/Ea) [18]. Ji Zhi et al. used electroacupuncture to treat myocardial hypertrophy in spontaneously hypertensive rats. The results showed that electroacupuncture could affect the signal transduction pathways of phosphatidylinositol kinase and protein kinase B in myocardial tissue, thus inhibiting the development of myocardial hypertrophy [19]. The control of blood pressure is the goal of the treatment of hypertension, and the main purpose of treatment is to reduce the incidence of cardio-cerebrovascular complications, disability and mortality. According to the report on Nutrition and chronic Diseases of Chinese residents (2020), 27.5% of Chinese adults (≥ 18 years old) suffer from hypertension, and people with normal high blood pressure account for 23.2% of adults [20]. It is urgent to prevent and treat cardiovascular disease caused by hypertension. Traditional Chinese medicine has made some progress in prevention and treatment. Cui Weifeng and others have found that Jiangya Bao (medication based on syndrome differentiation, one syndrome and one prescription) can reduce cardio-cerebral blood pressure events, with a benefit rate of 5% [21]. Pan Caiyu et al. Huayu Ditan Linao decoction combined with vinpocetine tablets can improve the indexes of cerebrovascular function, inflammatory factors and oxidative stress injury, which is beneficial to the recovery of hypertensive intracerebral hemorrhage [22]. Hypertension due to excessive activation of angiotensin aldosterone system, results in excessive contraction of renal arterioles, results in increased glomerular pressure and impaired renal function. Wang Chuangchang et al. used Bushen Yixin tablet to treat the early renal damage of hypertension with kidney yang deficiency syndrome, and found that it could not only improve blood pressure and symptoms, but also reduce the sensitive indexes of early renal damage, such as urinary microalbumin (mALB) and urinary β 2-microglobulin (β 2-MG) [23]. Yang Jiangmin and others also found that Yishen Pinggan decoction can reduce the mALB and β 2-MG of renal damage in the early stage of hypertension [24]. Lu Jiafeng and others used data to mine the medication rules of traditional Chinese medicine prescriptions for different syndrome types of hypertensive nephropathy, and obtained four core prescriptions, and each group contained *Atractylodes macrocephala* Koidz. *Atractylodes macrocephala* Koidz is a holy medicine for tonifying the spleen. The spleen is the acquired foundation, the biochemical source of qi and blood, spleen deficiency cannot nourish the congenital foundation, spleen deficiency can also cause clear yang but turbid yin does not fall, so the kidney should be treated from the spleen; it also summarized that *Atractylodes macrocephala*, *Salvia miltiorrhiza*, *Poria*, *Lycium barbarum*, *Eucommia ulmoides* were found to protect the kidney through modern pharmacological research [25].

4. Research status of antihypertensive Mechanism of traditional Chinese Medicine

At present, it is believed that the pathogenesis of hypertension is hormonal mechanism, neural mechanism, vascular mechanism, water and sodium retention and insulin resistance mechanism and so on. Therefore, the antihypertensive mechanism of traditional Chinese medicine is also studied from the aspects of RAAS, inhibition of sympathetic activity, inhibition of vascular remodeling, action of calcium antagonists, diuresis and improvement of

insulin resistance. In view of the current research situation, the details are as follows: in the hormonal mechanism, the research on traditional Chinese medicine is mainly angiotensin II (Ang II). Ang II can promote vasoconstriction and stimulate the adrenal cortex, and increase the secretion of aldosterone (aldosterone, ALD), which can increase the reabsorption of sodium and realize the preservation of sodium and the excretion of potassium. Wang Lihong et al. found that volatile oil of *Angelica sinensis* can reduce the levels of serum renin (PRA) and Ang II, thus reducing blood pressure, and that it can inhibit myocardial hypertrophy, improve the structure of myocardial tissue, and protect myocardial tissue injury [27]. Yu Lijie and other studies found that rhubarb and ephedra could reduce the levels of PRA, Ang II and angiotensin converting enzyme (ACE) to reduce blood pressure, and also affect the circadian rhythm of blood pressure [28]. Gan Haining et al. found that compound Qima capsule can reduce the levels of PRA, Ang II and ALD and play a role in reducing blood pressure [29]. Ren Zeming et al. found that *Dendrobium candidum* can affect the angiotensin II type 1 receptor in the kidney and reduce blood pressure [30]. Xiao Meifang and others found that Huoxue Qianyang granule can inhibit plasma ACE activity, reduce the production of Ang II, reduce blood pressure, improve hemorheology and reverse left ventricle [31]. The neural mechanism is one of the important characteristics of essential hypertension, and the sympathetic nerve has a great influence on the change of blood pressure. The sympathetic nerve is excessively excited, which stimulates the secretion of catecholamine, which constricts the blood vessels and causes the blood pressure to rise. Mabo et al. found that rhynchophylline/isorhynchophylline can inhibit the carotid sinus baroreceptor and inhibit the release of intracellular Ca^{2+} , thus reducing blood pressure and dilating blood vessels [32]. Chai Hui and other studies found that Dilong Jiangya capsule can reduce plasma catecholamine and regulate the level of renamine in serum, thus reducing blood pressure [33]. The influence of the changes of the function and structure of vascular endothelium on blood pressure cannot be ignored. The increase of blood pressure will damage the vascular endothelium, and the more serious the damage is, the greater the variability is. Blood vessels can not only regulate blood pressure through diastolic and contractile function, but also release nitric oxide (NO) and other substances from the endothelium to inhibit vascular inflammation. Meijiao and other studies found that turpentinol diglucose and quercetin in *Eucommia ulmoides* extract can regulate reduced coenzyme II oxidase so as to maintain NO balance and inhibit vascular inflammation [34]. Dai Nan and other studies found that Tianma Gouteng Yin can reduce the content of plasma endothelin-1, improve the ability of lazy endothelial contraction, and protect vascular endothelium [35]. Xie Xin and others found that Zhan-gan Xifeng decoction can reduce the apoptosis of vascular smooth muscle cells and protect vascular smooth muscle cells. Li Dapeng et al found that Tongxinluo capsule can reduce the levels of serum interleukin-6, tumor necrosis factor- α and C-reactive protein, reduce inflammatory reaction and improve vascular endothelial function [36]. In modern antihypertensive drugs, calcium antagonists can selectively block the transfer of calcium into cells, reduce the concentration of intracellular calcium, restore relaxation of smooth muscle, and achieve the purpose of relaxing blood vessels and lowering blood pressure. At present, studies have found that some traditional Chinese medicines also have the same effect. Wang Zuoyi et al found that Ghost Arrow *Uncaria* compound liquid can antagonize Ca^{2+} , and reverse L-type calcium current and reduce heart coefficient [37]. Zhang Jie et al found that salvia *miltiorrhiza* extract Danshensu and tanshinone can block L-type Ca^{2+} channel, block Ca^{2+} influx and inhibit myocardial hypertrophy [38]. Water and sodium retention is one of the current research directions in the pathogenesis of hypertension. The long-term use of modern diuretics has a variety of side effects on the human body, such as glucose and lipid metabolism disorders, increased uric acid, water and electrolyte disorders. Serious cases can cause arrhythmia, arteriosclerosis, coronary heart disease and diabetes. However, studies have shown that some traditional Chinese medicine and compound preparations of traditional Chinese medicine have obvious diuretic effect and do not cause electrolyte disorder, so it has a certain clinical research value. Zhang Wanlong and other studies found that Zexie decoction can reduce serum ouabain, and then increase urine volume [39]. You et al found that Wuling Powder can inhibit RAAS and reduce the content of Na^{+} in the body, thus increasing urine volume [40]. Zhao Yuhui and other studies found that *Poria cocos* extract *Poria cocos* has the effect of anti-aldosterone; increase the ratio of Na^{+} in urine, so as to achieve diuresis, and not easy to cause electrolyte disturbance [41]. Insulin resistance and hyperinsulinemia often occur in patients with essential hypertension. At present, it is believed that insulin resistance is also a pathogenic factor of hypertension. The treatment of hypertension with traditional Chinese medicine can not only control blood pressure, but also improve insulin resistance. Wang and other studies found that Jiangtang granule can reduce the level of tumor necrosis factor- α , restore muscle fiber composition, increase insulin sensitivity, and improve insulin resistance [42]. Hu et al. found that compound Zhenzhu Tiaozhi granule can activate insulin receptor substrate 1/intracellular phosphatidylinositol kinase pathway in insulin resistant HepG2 cells, up-regulate the expression of intracellular phosphatidylinositol kinase in adipose tissue, reduce serum triglyceride, total cholesterol and fasting blood glucose, and increase serum high density lipoprotein cholesterol-C [43]. Sui Yanbo and oth-

er studies found that Huanglian Wendan decoction can reduce the level of serum free fatty acids, regulate peroxisome proliferator activated receptor α , improve insulin resistance and promote lipid decomposition [44].

5. Summary

To prevent the occurrence of hypertension, we must pay attention to its risk factors, early intervention and treatment is the key to the prevention and treatment of its occurrence and development, and traditional Chinese medicine has a certain advantage in the treatment of non-disease. The treatment of hypertension and its complications by traditional Chinese medicine is gradually recognized, especially when combined with western medicine, it can not only enhance the antihypertensive effect, but also regulate metabolic disorders, and then improve the symptoms of patients. However, at present, the sample size of the study is relatively small, and it is still necessary to expand the sample size and carry out data research according to the real world in order to give better play to the role of traditional Chinese medicine in the treatment of diseases.

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