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Practical Tracking System of Intelligent Workshop Product Based on Wireless Sensor Network

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Abstract: As one of the traditional theories of traditional Chinese medicine, the theory of collaterals has a significant effect in the treatment of cardiovascular diseases. According to the initial link of atherosclerosis -- vascular endothelial damage, guided by the theory of collaterals disease, from the two perspectives of the vein vacuity and vein obstruction, Buyang Huanwu Decoction of tonifying Qi and promoting blood circulation and collaterals and Gualsankyx Baibanxia Decoction of eliminating phlegm and removing blood stasis and collaterals and Xuefuzhuyu Decoction are respectively given.Based on the past experimental demonstration, this paper aims to provide new ideas for clinical diagnosis and treatment.

1. Introduction

Atherosclerosis is a chronic disease with complex etiology. Local damage of intima occurs in the early stage, followed by lipid deposition, intima fibrous tissue hyperplasia, intima local thickening, and finally plaque formation[1].The main risk factors for atherosclerosis include lipid metabolism disorder, endothelial cell injury, inflammation and immune dysfunction, among which vascular endothelial cell injury is considered to be the main trigger for its occurrence and development[2].The pathogenesis of atherosclerosis is a multi-step process: upon activation, endothelial cells increase the expression of adhesion molecules, which promote monocyte recruitment within the vessel wall. Macrophages from these monocytes engulf modified lipoproteins, accumulate intracellular cholesterol, and become foam cells[3. 4]. On the other hand, endothelial cell dysfunction increases gradually, leading to uncontrolled production of toxic ROS, along with decreased production of anti-atherosclerotic signals NO and hydrogen sulfide (H2S), further exacerbating vascular disorders and inflammation, increasing oxidative stress, and contributing to the overall progression of the disease[5].

In recent years, the studies of traditional Chinese medicine on atherosclerotic vascular endothelial injury were mostly based on experiments, and directly expounded the protective effect of the drug molecular level on vascular endothelium has not been analyzed from the perspective of traditional Chinese medicine theory. The main research object of collaterals theory is complexions.

According to the analysis of traditional Chinese medicine image thinking, complexions are similar to the water conservancy system in human body, reaching the skin outside, the viscera inside, and passing qi and blood[6]. Since its shape and quality are related to blood vessels, the author tries to discuss the pathogenesis and treatment of atherosclerotic vascular endothelial injury from the Angle of collateral disease theory.

2. The Connotation of Collateral Disease Theory

2.1 Basic Content of Moving Target Tracking in Wireless Sensor Networks

Collateral disease is the disease of the meridian. It is mentioned in Lingshu ·Maidu that "the meridian is the inside, the branch and the cross are the collaterals, and the collaterals and the other ones are the sun", which shows the relationship between the meridian and the collaterals. Compared with the meridian, the meridian is a smaller branch. "Lingshu·Pulse Degree" recorded: "when the number of meridian, its improper number of collaterals." "Medical gate Law ·Theory of Collaterals disease" also mentioned: Twelve channels produce twelve collaterals, twelve collaterals produce 180 collaterals, collaterals produce 180 winding collaterals, winding collaterals produce thirty-four thousand sun collaterals. Thus, the whole complex system is very large and complex. Depending on such three-dimensional structure, the choroid system extends throughout the whole body, supporting various complex qi and blood movements as well as fluid and blood infiltration irrigation to maintain various life activities of the human body[6].

There are a variety of different ways of classification of choroid, from the size of the form can be divided into system, winding, sun; From the spatial structure can be divided into Yin and Yang collaterals; From the physiological function can be divided into qi and blood collaterals.

In Lingshu·Meridians, it is said that "all the floating and common veins are choroid veins". The "choroid veins" here should refer to Yang collaterals, that is, the choroid veins on the surface of human skin and visible mucous membranes are all Yang collaterals. "Clinical guide medical case" mentioned: "Yin collaterals is the viscera of the collaterals", visible Yin collaterals should be distributed between the viscera, meat in the complex are Yin collaterals.[7]

The word "Qi collaterals" first appeared in Zhang Jingyue's book "Class Classics·Four Volumes·Tibetan Elephant Types": "Blood is in the middle, while Qi collaterals are outside." At the same time, it also contains the function description of qi collaterals, namely, Qi collaterals carry the function of part of qi. There is a saying in the book, "The life of human beings depends on this Qi", which emphasizes the important role of qi in human life activities and the fundamental driving force of human life activities. According to Wu Yiling, qi collaterals are the realization form of qi function. The passage of qi into collaterals is collateralized qi[8]. Ye Tianshi once put forward that "Qi infuses collaterals, collaterals return collaterals", and it can also be understood that the concept of qi collaterals is closely related to its function[9]. It can be concluded that qi collaterals are the main organs of qi, that is, they play a role in transporting nutrients and reaching the whole body.

The word "blood collaterals" first appeared in Lingshu. In the Lingshu Sutra ·Evil Guest, it is said, "All the eight vacuous persons are the chambers of organs...Where the blood collaterals swim..., stay will hurt the tendons and joints organs, not flexion and extension, so the mechanism is also", that is, the blood is distributed in the joint of the superficial blood vessels. Ma Shuran[10] proposed that blood collages are small branches and continuations of blood vessels, which together with blood vessels constitute a complete blood flow circuit and infuse the whole body. Based on the blood vessels of the heart, the blood collages of the heart are further discussed. Therefore, the nurturing effect of the veins cannot be ignored when discussing cardiovascular diseases. Wu Yiling [11] believed that the collaterals of blood collaterals were also called veins, and that their physiological function was running blood. Based on this, he discussed the correlation between veins

and vascular system[12]. It can be seen that no matter from which Angle, blood collaterals and blood have been linked, so that it has objective reality.

It can be seen that Qi collaterals bear the transmission of information, and blood collaterals are the material basis. If Qi collaterals are damaged, information transmission is abnormal, which is manifested as dysfunction. If blood collaterals are damaged for a long time, pathological substances are easily generated, which is manifested as substantive damage.

3. Atherosclerotic Vascular Endothelial Injury is the Disease of the Complex Vein

3.1 Disease from Collaterals, Collaterals Deficiency Internal Injury

"Lingshu ·Benzang" mentioned: "The meridians, so the flow of blood and qi and Yin and Yang, moisten the muscles and bones, joint also", as a branch of the meridians, also assume the function of running qi and blood, communication between Yin and Yang.Endothelial cells act as a barrier for the selective exchange of substances in blood and interstitial fluid, as well as the main site of cellular blood supply and nutrient exchange[13]. It can be seen that both the choroid vein and the vascular endothelium play an internal and external role in communication, and both play the role of media in the process of qi and blood exchange.In terms of spatial structure, the complex has the characteristics of horizontal branch separation, layer by layer subdivision and network distribution, and in terms of qi and blood operation, it has the characteristics of slow qi and blood flow, surface type dispersion, two-way flow, terminal connectivity and function regulation [14]. Due to its small physiological characteristics, its pathogenesis is easy to stagnation and blood stasis, easy to enter and difficult to exit, and easy to accumulate and form[15]. Vascular endothelial damage is the pathological basis of atherosclerotic plaque formation. It is in a state of balance between damage and repair in physiological state. Once the homeostasis is destroyed and lipid deposition occurs, plaque is easily formed.

3.2 Qi and Blood Stasis, Flow Disorders

The function of the choroid is reflected by the classification of qi and blood collaterals.The author thinks that Qi collaterals and blood collaterals are not two kinds of veins in shape and quality, Qi and blood go together, Qi is the handsome blood, blood is the mother of Qi, blood belongs to Yin, Qi belongs to Yang, blood has Qi to promote the operation, Qi has blood to carry the ability to nourish.Tangible blood to convey material, invisible Qi to convey information, both indispensable. Zhang Jingyue said in the "Class Classic" : "Ying Wei Qi, by collaterals to Tong, so to Tong Ying Wei", Wei Qi line outside the pulse, Ying blood line in the pulse, the two through the complex veins. In blood vessels, endothelial cells, as a part of the blood vessel wall, restrict blood flow in the veins, but also deliver oxygen and nutrients to the body, similar to the function of the complex. Choroid disease, then Ying wei disorder, Qi and blood operation is blocked, prone to pathological products, blocking choroid.After the vascular endothelium is damaged, the damaged tissue releases a variety of factors to produce inflammatory response, and eventually thrombosis is formed, resulting in the dysfunction of microcirculation.

The theory of atherosclerotic endothelial injury response [16] holds that endothelial dysfunction is the pathological basis before endothelial injury, and then substantial endothelial injury is caused, leading to progressive aggravation of dysfunction. From the point of view of collateral disease, the course of the lesion develops from qi to blood. Qi fraction is mainly manifested as the imbalance of vascular endothelial homeostasis, while blood fraction is mainly manifested as the formation of intravascular thrombosis, which has substantial influence on microcirculation disturbance.

4. To Understand the Pathogenesis of Atherosclerotic Vascular Endothelial Injury from the Theory of Collateral Disease

Wu Yiling[17]believed that the pathogenesis of collaterals disease consisted of eight aspects: collaterals qi stagnation, collaterals stasis, collaterals deficiency, collaterals stasis, collaterals stasis blockage, collaterals stasis, collaterals accumulation, heat toxicity stagnation collaterals, collaterals deficiency and collaterals stagnation. However, the author believed that these eight factors included two aspects: collaterals deficiency and collaterals stagnation.

4.1 Loss of Choriotomy, Qi and Blood Loss

The deficiency of collaterals and the loss of collaterals are easy to be invaded by external evil, the flow of qi and blood is abnormal, and the loss of viscera and Yin collaterals is easy to produce lesions. Choroid deficiency includes Yin deficiency, Yang deficiency, qi deficiency and blood deficiency. If choroid is inherently deficient, the viscera, limbs and eight skeletons that depend on choroid Rongnourishing will eventually be affected and have corresponding pathological changes. "Lingshu·Baishinsheng" cloud: "life is not joint, excessive exertion, then the choroid injury", mainly emphasizes the impact of bad daily living habits on choroid.In the pathogenesis of atherosclerotic blood vessels, endothelial dysfunction is mostly induced by pathological factors such as blood scour, pathogenic microorganisms, smoking, mechanical damage and lipid infiltration[18], thus resulting in endothelial injury. The injury of endothelial cells will lead to the injury of vascular barrier function, and the change of vascular intima integrity and permeability[19].

4.2 Phlegm Stasis Starts, Blocking the Choroid

"Plain question·Arthralgia Theory" cloud: "Disease long into the deep, Rongwei astringent, meridian when sparse", collateral disease day long camp wei disorder, Qi and blood is not smooth, body fluid delivery disorder, phlegm turbidized blood stasis.Collateral hysteresis is the common outcome of these pathological factors. In the late stage of the disease, the deficiency of the complex veins combined with the blockage of the complex veins, leads to the obstruction of the complex veins, the obstruction of qi and blood, the coexistence of functional lesions and organic lesions, and the treatment of the time to pass as the key.Apoptosis and shedding of endothelial cells promote the adhesion and aggregation of blood platelets[20]. Dysfunctional endothelial cells, macrophages, and platelets secrete a variety of growth factors and vasoactive substances, which stimulate the continuous proliferation of smooth muscle cells into the intima and trigger the contraction of the vascular wall[21]. Eventually, fatty plaque volume increases and vascular lumen gradually Narrows, promoting the formation of atherosclerotic lesions[22].

5. The Methods of Treatment

There is no TCM disease name of atherosclerosis in TCM classics, but according to its clinical manifestations, it can be classified into the categories of "vertigo", "pulse Bi" and "pulse accumulation". Li Hongrong et al. [23] proposed that collateral-qi stagnation or deficiency stagnation is the initial link of atherosclerosis.This can also indicate that the essence of atherosclerotic vascular endothelial injury is the complex as the disease, which belongs to the primary deficiency with solid, and the deficiency leads to solid, and the deficiency and solid are mixed, and the pathogenesis is mainly the complex emptiness and complex block.If the complexation is empty, the complexation is lost, the transport of qi and blood function is abnormal, for a long time, the qi stagnation and blood stasis, the generation of phlegm and dampness, blood

stasis and other pathological products, blocking the pulse, so that the complexation is blocked.Collaterals disease takes tong as the key. Whether the complexions are empty or blocked, the final outcome is that the complexions are blocked and the qi and blood can not flow smoothly. Therefore, collaterals are the key to the treatment of collaterals disease, but different collaterals drugs should be selected according to the different stages of the disease course and the different characteristics of the disease.

5.1 Tonifying Qi and Promoting Blood Circulation

The first stage was characterized by functional dysfunction, Qi deficiency and not much blood stasis. The appropriate treatment was to tonify Qi and promote blood circulation and collaterals. The prescription was Buyang Huanwu Decoction created by Wang Qingren in the Qing Dynasty.Buyang Huanwu Decoction is composed of astragalus, Angelica, red peony root, Dilong, ligusticum Chuanxiong, safflower and peach kernel. The reuse of astragalus in the prescription is intended to replenish qi to promote blood circulation, blood circulation is removed, and the veins are self-tonic.There has been evidence[24. 25] that Buyang Huanwu Decoction combined with Western medicine has a significant effect on the treatment of coronary atherosclerotic heart disease, which can not only effectively relieve the symptoms of angina, but also has a significant positive effect on the molecular level.

Buyang Huanwu Decoction can not only intervene in vascular endothelial injury, protect endothelial cells, but also reverse vascular endothelial dysfunction[26]. Liu Zhiyong et al. [27] proved through experiments that Buyang Huanwu Decoction could reduce the expression levels of p38MAPK and ERK1/2 by regulating the MAPK kinase signaling pathway, thus improving cell permeability, maintaining the integrity of endothelial cells, ensuring the normal function of endothelial cells, and finally realizing the anti-atherosclerosis effect.In addition, Buyang Huanwu Decoction also has a positive regulatory effect on NO produced by endothelial cells, so it has a certain protective effect on different stages of atherosclerosis[28]. It can be seen that Buyang Huanwu Decoction has a significant therapeutic effect on atherosclerotic endothelial injury. Guided by the theory of collateral disease, it may be feasible to use Buyang Huanwu decoction in the treatment of complex vein emptiness.

5.2 Eliminating Phlegm and Removing Blood Stasis and Dredging Collaterals

Complex block is the second stage, at this time with organic lesions as the main characteristics, phlegm and blood stasis knot, blockage of the complex, appropriate treatment phlegm to remove blood stasis and collaterals, the prescription selected Gualou Allium Baibanxia decoction and Xufuzhuyu decoction.According to clinical grouping observation[29. 30], Gualsanx Stemon Banxia Decoction combined with Xuefu Zhuyu Decoction has significant curative effect on phlegm-stasis interjunction type of coronary atherosclatherosclerosis heart disease, which can not only reduce the frequency of angina, but also shorten the onset time of angina.

Li Jinxi et al.[31] found in animal experiments that Fructus Santhis allium Stemon Banxia decoction can increase the serum NO and reduce the expression levels of endothelin-1, angiotensin Ⅱ, and ox-LDL, suggesting that Fructus allium allium can effectively regulate vascular endothelial dysfunction, reduce oxidative damage, and protect vascular endothelium.Shen Zhongqi[32] proposed that the mechanism by which Gualsankyu Stemon Baibanxia Decoction alleviates vascular endothelial injury may be realized through the ALK1-LDL pathway.

Wang Qi et al.[33. 34] found that Xuefuzhuyu decoction not only had a certain protective effect on endothelial injury in morphology, but also could regulate the release balance of endothelin and NO in endothelial cells, reducing the influence of anticoagulation and fibrinolytic dysfunction

caused by endothelial injury. Geng Zhaohui et al.[35-37] also observed the protective effect of Xuefuzhuyu Decoction on vascular endothelial cells in rat models of atherosclerosis by morphology, reducing the contents of endothelin and angiotensin Ⅱ in endothelial cells and increasing the content of SOD in serum, so as to reduce the damage of free radicals in vivo on endothelial cells and protect the morphology and function of endothelial cells.Zhang Wei et al.[38] took the rat with endothelial injury as the experimental object and demonstrated that Xuefu Zhuyu decoction can promote the repair of damaged vascular endothelium through endothelial progenitor cells.

6. Conclusion

The theory of collateral disease has great scientific research value, and also has significant guiding significance for the clinical treatment of cardiovascular diseases. The intervention of the theory of collateral disease has a great promoting effect on the pathogenesis analysis and treatment methods and prescriptions, and the clinical practicability is extremely high.At present, the research on atherosclerotic vascular endothelial injury is mainly based on experimental demonstration, but there is a lack of traditional Chinese medicine theory to discuss its pathogenesis. This paper aims to take the theory of collateral disease as a bridge, linking scientific experiments with the theory of traditional Chinese medicine, so as to better guide the clinical syndrome treatment.

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