

Construction of the Vessel-collateral Theory and its Guidance for Prevention and Treatment of Vasculopathy

China

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Summary

In traditional Chinese medicine, the vessel-collateral theory was constructed systematically and considered important in improving the prevention and treatment level of vasculopathy, or diseases of the blood vessels. The hypothesis of ‘homeostasis’ (*Cheng*), compensatory auto-adaptation (*Zhi*), regulation (*Tiao*) and equilibrium (*Ping*), based on the ‘*qi-yin-yang-five elements*’ coupled with the *ying* (nutrients)-*wei* (defence) theory, has become the core content of the vessel-collateral theory. Clinical and laboratory trials have been developed to further confirm the scientific connotations of the hypothesis and have resulted in a set of capsules for treating various vasculopathies.

For example, *Tong Xin Luo* capsules developed using vessel collateral theory showed good efficacy in protecting the vascular endothelium, stabilizing vulnerable plaques and reducing blood vessel spasms, helping in the treatment of acute myocardial infarction, cerebral infarction and the microvascular complications of diabetes. *Shen Song Yang Xin* capsules for the treatment of arrhythmia have also contributed an integrated adjustment advantage. Likewise, *Qi Li Qiang Xin* capsules have been developed for the treatment of both the manifestation and the root cause of chronic heart failure. Thus this research has improved both prevention and treatment of major vascular system diseases.

Background and Justification

According to WHO statistics from 2000, some 17 million people die of cardiovascular diseases each year. The Statistical Gazette on Healthcare Development in China, issued by the Ministry of Health of China, has indicated that cardiovascular diseases are the leading cause of mortality and proportional mortality since 1990, responsible for 40% of all deaths. Additionally, in 2006, the Annual Reports of Cardiovascular Diseases showed that, every year, two million people develop cerebral apoplexy, 500,000 people develop myocardial infarction and almost three million people die of cardiovascular diseases. In China, such figures are linked to the distinctive features of ‘three highs and three lows’ – a high incidence, high disability rate and high mortality combined with low awareness, low control rate and low recovery rate.

The explanations provided by reductionist thinking to explain disease have been increasingly challenged by the emergence of global complexity science. Subsequently, a return to holism has become the core driving force of the life sciences in the 21st century to explain or interpret living organisms using nonlinear science, complex systems and systems biology. Deeply rooted in clinical practice, early philosophical thinking of ‘extending one’s knowledge through investigation’ (*Ge Wu Zhi Zhi*) and dissection,

traditional Chinese medicine contains ancient philosophical ideas of *qi-yin-yang*-five elements. It combines the meta-physical '*qi*' with anatomical 'blood' and understands the internal law of life activities and disease development and progression from a holistic, systematic and constantly changing perspective. In this regard, traditional Chinese medicine is of practical significance in the shift from reductionism to a holistic study system, thereby creating an opportunity for innovative advances in the prevention and treatment of cardiovascular diseases.

Description

Vessel-collateral theory studies the occurrence and development law, essential pathology, clinical signs and symptoms, pattern identification, and the treatment of 'vessel collateral-vascular system conditions'. Vessel-collateral conditions can result either from the functional or structural injury to blood vessels and collateral vessels (that direct blood around injured blood vessels), from pathogenic factors, or from secondary pathology of the *zang-fu* organs or tissues. They cover a wide range of cardio-cerebrovascular diseases, including arrhythmias, chronic heart failure, pulmonary heart conditions, rheumatic heart disease and peripheral angiopathy. Common examples are cardiac pain due to angina, stroke, palpitations, cardiac fullness, oedema due to heart *yang* deficiency, thoracic fluid retention, cardiac obstruction and gangrene. Unfortunately, the conceptual confusion between 'meridians and vessels' and 'meridians and collaterals' originating from the historical prejudice towards 'collaterals' and 'vessels' compromised the importance of vessel-collateral theory and its resultant guidance for the prevention and treatment of vasculopathy, or diseases of the blood vessels. Consequently, constructing a systemic vessel-collateral theory has helped improve the prevention and treatment of vasculopathy.

As pathways of circulating *qi* and blood, meridians are associated with the *zang-fu* organs and connect the upper body with lower body and the interior with the exterior. The *Nei Jing* (Inner Classic) states that "meridians are located in the deeper area, while collaterals are the transverse branches of the meridians and minute collaterals are subdivided branches of the collaterals". In other words, collaterals diverge from the meridians and contain different layers. They are extensively distributed over the *zang-fu* tissues, like a network system to maintain life activities and homeostasis of the organism.

Collaterals are further divided into meridian collaterals and vessel collaterals. The former transport *qi*, while the latter transport blood. Together they constitute two major inter-dependent but interactive networks that perform the physiological functions of "circulating *qi* and blood as well as nourishing *yin* and *yang*". With a combined vessel

collateral and meridian collateral theory, the academic system of Chinese medicine consists of the *zang xiang* (core), meridians (pivot) and *qi* and blood (foundation).

Other than a network for transporting blood, the 'vessels' are the pathways of the heart (lung)-blood-vessel circulation system and also an independent solid organ, an extraordinary fu-organ. Morphologically, vessels are empty cavities and associated with the heart and lung. Categorized into veins and arteries, vessels are distributed in a multi-layered network. Physiologically, vessels store and preserve essential *qi* to maintain a relative homeostasis of blood volume and quality. Kinetically, vessels dilate and contract following heart beats. Functionally, vessels transport blood to nurture the whole body, help metabolism and promote interchange between blood and other fluids. The *Shanghang Za Bing Lun* (Treatise on Cold Damage and Miscellaneous Diseases, 1976) recorded the concept of 'vessel collateral', discussed vessel-collateral conditions, initiated the collateral-unblocking formulae and thus laid the theoretical, diagnostic and therapeutic foundation of vessel-collateral theory.

Clinical and laboratory trials have confirmed the scientific connotations of vessel-collateral theory and have resulted in a set of capsules for treating various vasculopathies. *Tong Xin Luo* capsules showed good efficacy in protecting the vascular endothelium, stabilizing vulnerable plaques and reducing blood vessel spasms, helping in the treatment of acute myocardial infarction, cerebral infarction and the microvascular complications of diabetes. *Shen Song Yang Xin* capsules for the treatment of arrhythmia have contributed an integrated adjustment advantage. Likewise, *Qi Li Qiang Xin* capsules have been developed for the treatment of both the manifestation and the root cause of chronic heart failure. Thus this research has improved both prevention and treatment of major vascular system diseases.

Impact

The project developed the 'pattern identification and treatment of collateral disease' and helped establish a new discipline of collateral disease theory in practice. Groundbreaking treatment protocols were coupled with new national patent medicines: *Tong Xin Luo* capsules for cardio-cerebrovascular disease, *Shen Song Yang Xin* Capsules for cardiac arrhythmias, and *Qi Li Qiang Xin Jiao Nang* for chronic heart failure.

The development of these treatments has received various awards, including:

- Five first prizes in provincial/ministerial projects;
- Second prizes for national science & technology inventions, and for national science & technology progress;
- The Holeung Ho Lee Foundation prize.

In addition, an academic book prize, 'Collateral Disease Theory in Practice', was published by the China Association of Chinese Medicine.

Lessons Learned

All the above studies have proven the guidance, scientific value and future application potential of the homeostasis (*Cheng*), compensatory auto-adaptation (*Zhi*), regulation (*Tiao*) and equilibrium (*Ping*) hypothesis, which is the core of the vessel-collateral theory. In addition, the theory may also become a key idea for multidisciplinary studies on vasculopathy, which will guide our further understanding of complex vascular system diseases.

Future Plans

Research will continue to guide vascular disease prevention in chronic heart failure, arrhythmias and coronary heart disease.

Publications

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