

Hypothesis

Broad extension of the Five-wheel theory

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Highlights

With the rapid development and progress of modern science and technology, the new and high-end ophthalmic examination instrument, represented by slit lamp, has gradually entered the eyes of ophthalmologists, opened the study of fundus diseases, and gradually explored the Chinese medicine ophthalmological dialectical thinking mode of fundus disease, which is called "inner five wheel " hypothesis. It is of general methodological significance and is helpful for clinical doctors to broaden their thinking based on differentiation and treatment, but it is only a hypothesis and can not be thought-set.

Abstract

Objective: To study the broad scope of the "five-wheeltheory" and perfect the theoretical system of the "five-wheel theory. **Methods:** By searching the literature, the five-wheel doctrine was extended in a broad sense, combining the traditional five-wheel doctrine and the related dialectical thinking mode of the inner five-wheel hypothesis. **Conclusion:** All the muscle fibers inside and outside the eye, including ciliary muscle and extraocular muscle, are controlled by the spleen. The soft tissues of the fascia represented by the suspensory ligament of lens, cornea, sclera, uvea and retina (except the components of blood vessels) are all dominated by the liver. The blood vessels inside and outside the eyes represented by the middle retinal artery are all controlled by the heart; the water and visual pathway represented by tear and aqueous humor (including refractive system and nerve conduction system) are controlled by the kidney, in which the secretion of glands is controlled by the spleen. The coordinated function of refractive system and visual pathway is controlled by the lung.

Keywords: Five wheel-theory, Inner-five-round hypothesis, Dialectical thinking mode, Hypothesis

Abbreviations:

TCM, Traditional Chinese Medicine;

Competing interests:

The authors declare that there is no conflict of interest.

Citation:

Wei-Dong Lai, Hang-Bo Cai, Xiao-Gu Liu. Broad extension of the Five-wheel theory. TMR Theory and Hypothesis 2020, 3(2): 331-336.

Executive Editor: Lu Wang, Xue Wang

Submitted: 10 April 2020, **Accepted:** 1 May 2020, **Online:** 20 June 2020.

Introduction

The traditional five wheel-theory is based on the eye observation of ancient doctors, so that the eyes are artificially divided into five regions with different corresponding organs. It is still one of the important theories of traditional Chinese medicine ophthalmology so far, and as a traditional Chinese medicine ophthalmology dialectical thinking mode. But with the rapid development and progress of modern science and technology, the new and high-end ophthalmic examination instrument, represented by slit lamp, has gradually entered the eyes of ophthalmologists, opened the study of fundus diseases, and gradually explored the Chinese medicine ophthalmological dialectical thinking mode of fundus disease, which is called "inner five wheel". The traditional five wheel-theory mainly stays in the differentiation and treatment of the external obstacle eye disease, while the inner five-round theory focuses on the cataract eye disease, both of which are two-dimensional and plane syndrome differentiation patterns. And the human eye is ellipsoid and three-dimensional, so it needs comprehensive analysis of all-round, multi-dimensional and comprehensive syndrome differentiation mode, so as to get the accurate differentiation plan.

1.The Theory of the External Five Wheel and Its Syndrome Differentiation

Five wheel-theory learning originates from the theory of "Miraculous Pivot": "the essence of the five viscera and the six entrails is all focused on the essence of the eye.", "Peaceful Holy Benevolent Prescript" proposed that "The five rounds should be based on the five internal organs. "And put forward that the five rounds should be matched with the five internal organs. And on the other hand, *Renzhai Zhi Zhi Fang* further defines the relationship between the five rounds and the five internal organs, which makes the theoretical system of the five rounds theory further improved and has been used so far [1].

The traditional five-wheel theory is based on the careful observation and analysis of the external eyes of ancient doctors, which is mainly used for the diagnosis and treatment of external ophthalmopathy in traditional Chinese medicine ophthalmology. The eye is artificially divided into five parts, namely, pupil, black eye, canthus, white eye and eyelid, which are called water wheel, wind wheel, blood wheel, air wheel and flesh wheel, respectively, which correspond to the five internal organs of kidney, liver, heart, lung and spleen. The pupil is the present pupil and its subsequent tissue, the black eye is the same as the present cornea, the white eye is the present sclera, and the eyelid is the

eyelid.

The five-chakra theory is not only the theory of ophthalmology of traditional Chinese medicine, but also a typical representative of the thinking mode of clinical diagnosis of traditional Chinese medicine. For example, eyelid diseases can be treated from the spleen, canthus diseases can be treated from the heart, white eye diseases can be treated from the lung, and black eye diseases can be treated from the liver. Pupil diseases can be treated from the kidney. This theoretical model sublimates the syndrome differentiation of Zang-fu organs in TCM diagnostics, enriches the thinking mode of TCM clinical syndrome differentiation, and the theory also accords with the diagnosis and examination principle of "TCM diagnostics". It has an indelible contribution to the clinical differentiation and treatment of TCM ophthalmologists, as well as to the inheritance of TCM ophthalmology.

2.The Theory of inner five wheel and its syndrome differentiation

With the progress of science and technology, the clinical diagnosis equipment of traditional Chinese medicine ophthalmology has been updated, and the advanced diagnosis equipment represented by slit lamp has gradually penetrated into the clinical diagnosis of traditional Chinese medicine ophthalmology. TCM ophthalmologists' research on fundus diseases has been supported by the equipment. Important fundus anatomical structures such as optic nerve, retinal neuroepithelium, choroid and retinal vessels, macular, vitreous and retinal pigment epithelium have been discovered one after another, which enriches doctors' in-depth understanding of fundus diseases and improves the ability of clinical doctors in the diagnosis and treatment of cataract ophthalmopathy.

Among them, Qiu Lixin [2] put forward the "Inner five-wheel hypothesis" based on the clinical practice of traditional Chinese medicine ophthalmology, which holds that the optic nerve is formed by the aggregation of retinal ganglion cells, while the liver Channels of Foot-Jueyin is on the eye system and is directly connected with the eye system. Therefore, it is considered that the optic nerve and retinal neuroepithelial layer belong to the liver. Choroid, also known as vascular membrane, has rich vascular structure, and retinal vessels have the same nutritional function as the heart, so they both belong to the heart. Macula is located in the center, according to the theory of the five elements in the middle earth, macula should belong to the spleen. Vitreous body, also known as divine ointment, its color is transparent, so it belongs to the lung. The retinal pigment epithelium should belong to the kidney, coincide with the retinal nerves, and is homologous to the liver and kidney. The

thinking system of clinical syndrome differentiation in traditional Chinese medicine ophthalmology has been improved.

3. The orientation and limitation of the two theories, the five-wheel theory extends broadly

As we all know, the eye is ellipsoidal and three-dimensional. From the above two theoretical models, the traditional five-wheel theory is based on the naked eye observation of physicians, focusing on the diagnosis and treatment of external barrier ophthalmopathy. The "inner five-wheel hypothesis" is based on the observation of modern ophthalmic instruments and the anatomical structure of the eye in normal human anatomy, and tends to the diagnosis and treatment of cataract ophthalmopathy. But both of them are two-dimensional and plane dialectical models. It is difficult to carry out omni-directional, multi-dimensional and comprehensive syndrome differentiation of the eye in order to achieve the purpose of accurate positioning, comprehensive analysis and accurate syndrome differentiation. Therefore, the related concepts, scope and dialectical theoretical system of the traditional five-wheel theory and the "inner five-wheel hypothesis" need to be further expanded and extended.

4. New five-wheel syndrome differentiation model

The ancient five-round doctrine focused on the outer eye, while the inner five-round doctrine focused on the inner eye. Despite the Plain Question puts forward the viewpoint of "fascia of liver and muscle of spleen", which holds that fascia of human body is in charge of liver and muscle of human body is in charge of spleen. But in fact five physiological anatomical parts of eyes, such as "eyelid", "black eye" and "white eye", are not only subordinate to spleen.

Therefore, according to the characteristics of the above-mentioned ocular physiological anatomy, we extend the corresponding range of disease position differentiation derived from the five-wheel theory model as follows:

4.1 The liver dominates the tendon and the spleen dominates the muscle.

The ciliary muscle of the eye is mainly composed of smooth muscle cells and is covered with fascia, which is like a sheath covering the muscle bundle. It is innervated by sympathetic and parasympathetic nerves. There are also various extraocular muscles which regulate the rotation of the eyeball and even smooth muscle cells in the arteriovenous to protect the vasomotor elasticity and wall tension.

Traditional Chinese medicine believes that the spleen dominates the muscle, so the relevant tissue components belong to the spleen soil category. The lens suspensory ligament is the most representative

ligament in the eye, which belongs to the category of fascia and soft tissue, and the ligament belongs to the fascia and soft tissue. In addition, the cornea, sclera, uvea and retina (except vascular components) are also fascia and soft tissue, and the liver is the main tendon, so it belongs to the liver. Taking the ciliary body as an example, the early smooth muscle can be compensated, and the ciliary muscle is in the regulatory reflex by improving muscle strength and muscle tension, but it is easy to form regulatory tension. The muscle cells in the middle stage are in the relative refractory period for a long time, and the muscle strength and muscle tension further increase, and the spasm of the ciliary body can occur at this time, that is, regulating spasm, which belongs to the category of "internal wind" and "spasm syndrome" in traditional Chinese medicine. Yong-Wang Zhao et al think that Yiqi Jianpi decoction in this stage of accommodative myopia can relieve ciliary muscle spasm and control the further development of myopia. In the later stage of decompensation, the muscle cells are in the absolute refractory period, but the muscle strength and muscle tension decrease, which belongs to the category of "impotence syndrome" of traditional Chinese medicine. Physiologically, the ciliary body consists of the mesentery of the ciliary muscle and the outer quilt, which regulates the relaxation and contraction of the muscle affected by nerves. Guangxin Yue et al believe that the smooth muscle system is the effector of the liver, so it can be seen that the method of softening the liver and invigorating the spleen can run through the treatment of myopia in traditional Chinese medicine ophthalmology. Similarly, the way of invigorating the spleen and soothing the liver can still be used for blepharospasm. Lu-Quan Chen et al believe that the acupuncture method of invigorating the spleen and soothing the liver is statistically significant in the treatment of benign primary blepharospasm. Jingya Ruan et al [6] found that Jianzheng Powder is effective in the treatment of blinking in children. In addition, Ji-Ke Song et al [7] found that Qinghuo Rukan Mingmu recipe was effective in treating acute uveitis. Jian-Feng Chen et al [8] used Shaoyao Qinggan San to treat acute anterior uveitis effectively. Yan Song et al [9] found that Qinggan Mingmu prescription had an intervention effect on the expression of cytokine mRNA in patients with acute uveitis. Xiao Zhang et al [10] advocated that optic neuritis should be treated from the liver. That is to say, the above can prove the relationship between spleen and eyelid, ciliary muscle, liver and uvea. By the same reasoning, retina and other internal and external fascia soft tissues (except vascular components) should belong to the liver, and the muscles (muscle fibers) inside and outside the eye should belong to the spleen.

4.2 The heart is the main pulse, and the kidney is born with nature.

The blood vessels of the whole body are dominated by the heart, and the same is true of the eyes. In addition to the blood vessels of the inner and outer canthus, the blood vessels of the eye, such as the middle retinal artery, all belong to the category of "vessels" and "pulse channels" of traditional Chinese medicine, and the heart governs the blood vessels. Therefore, all kinds of blood vessels inside and outside the eye belong to the heart, while the nutrients in the internal tissue of the eyeball are mainly provided by blood circulation and aqueous humor circulation, and the small molecular water in the blood vessels of the eye can be circulated through the capillary network and extravascular fluid. This is the embodiment of "homology of fluid and blood" in traditional Chinese medicine, and at the same time, the eye maintains the balance inside and outside the eye by means of crystal osmotic pressure and colloid osmotic pressure. When inflammation occurs, vascular permeability increases, fluid exudation increases. The secretion of tears is affected by sympathetic and parasympathetic nerves and regulated by glands, which belong to the body fluid inside and outside the eye. "Mingmen" is the pupil of the eye, specifically, it should be the visual pathway of the whole eye. The kidney governs the water, closes the storage, holds the congenital foundation, and the kidney dominates the water. The whole water system inside and outside the eye, represented by tears and aqueous humor, should be dominated by the kidney. Therefore, vascular diseases such as fundus can be treated from the heart, and disorders of water metabolism inside and outside the eye can be treated by the kidney. Therefore clinicians also focus on the heart and kidney. Rongchuan Tang 's Theory of Blood Syndrome holds that blood syndrome is "discord between blood and water". Zi-Jin Sai et al [11] supposed that Dahuang Zhechong pill is effective in the treatment of traumatic vitreous, macular hemorrhage and age-related macular degeneration. Jun Peng et al [12] summed up Professor Peng's experience and found that blood and water are physiologically homologous. Pathologically, water and blood can influence each other, and the treatment of upper blood can be treated at the same time. It is effective for visual pathways such as vitreous hemorrhage, retinal vein occlusion, central serous choriopathy, central exudative choriopathy and extraocular vascular hemorrhage. In addition, Qiu-Yan Ma et al [13] found that in the treatment of primary open-angle glaucoma with traditional Chinese medicine, there were the largest number of literatures on "traditional Chinese medicine for promoting blood circulation and promoting blood circulation, traditional Chinese medicine for tonifying kidney and promoting blood circulation and promoting blood circulation". Among the drugs, there were more meta analysis

related to promoting blood circulation and promoting water, tonifying kidney, activating blood circulation and promoting blood circulation, and the effect was better.

4.3 The lung is oriented towards the hundreds of vessels and is mainly controlled and regulated

Cornea, lens, vitreous body and aqueous humor are components of the refractive system, all of which are transparent and non-stagnant normal eye refractive system. "lung governs qi" and "lung faces a hundred pulse". For the eye, one is to coordinate the normal operation of visual function, which is different from the visual pathway dominated by the kidney. The other one is partial to the organic pathway, one is partial to the function, that is, the formation of vision. The second is the strength of visual ability. it is a high summary of the various abilities that make eye vision normal, that is, the refractive system is dominated by the lung and kidney, and the kidney returns the whole visual pathway without stagnation. The coordinated exertion of the function of the main visual pathway of the lung.

It is worth noting that although the kidney dominates water, the secretion and regulation of the corresponding glands should be dominated by the spleen, which not only dominates the muscles, but also controls the opening and closing of the glands of the body. For example, the treatment of diarrhea with Ganjiang (*Rhizoma Zingiberis*), Cangzhu (*Rhizoma Atractylodis*) and other methods of dryness of the spleen, which makes use of the inhibitory effect of the spleen on glands. So it also has a regulatory effect on the secretion of glands in the eye, that is, "Qi can absorb body fluid". The same as the effect of atropine on inhibiting glandular secretion [14].

Although the extraocular and extraocular muscles are dominated by the spleen, the fascia soft tissue (except vascular components) is dominated by the liver, the blood vessels are dominated by the heart, the visual pathway and water metabolism are dominated by the kidney, and the coordinated operation of visual function and visual ability are dominated by the lungs. However, because the same anatomical tissue often contains different components, multiple disease sites will be involved in differential diagnosis and treatment. Xin Li et al [15] found that the drugs for diabetic retinopathy are mainly traditional Chinese medicine for tonifying qi, tonifying yin, activating blood circulation and clearing heat, which involve spleen, heart, liver, kidney and other systems.

Conclusion

To sum up, the traditional five-wheel theory focuses on the differentiation and treatment of external barrier ophthalmopathy, and the "inner five-wheel

hypothesis" tends to the differentiation and treatment of cataract ophthalmopathy, both of which belong to two-dimensional syndrome differentiation model. And the eyeball is anatomically three-dimensional and needs a multi-dimensional dialectical thinking mode. therefore, based on the above theory. We puts forward a generalized extension of the five-wheel theory, that is, all muscle fibers inside and outside the eye, including ciliary muscle and extraocular muscle, are dominated by the spleen. The fascia soft tissues represented by lens suspensory ligament, cornea, sclera, uvea and retina (except vascular components) are dominated by the liver, and the extraocular and extraocular vessels represented by the middle retinal artery are dominated by the heart. The water and visual pathways represented by tears and aqueous humor (including refractive system and nerve conduction system) are dominated by the kidney, in which glandular secretion is regulated by the spleen. The coordination of refractive system and visual pathway is dominated by the lung. On the basis of normal human anatomy, clinical treatment and related literature, this theory is extended by deductive deduction method and other TCM thinking. It is of general methodological significance and is helpful for clinical doctors to broaden their thinking based on differentiation and treatment, but it is only a hypothesis and can not be thought-set.

References

1. Peng QH. Ophthalmology of Traditional Chinese Medicine. Beijing: China Press of Traditional Chinese Medicine, 2016.
2. Qiu LX. Application of "inner five rounds" hypothesis in the treatment of fundus disease. *Chin J Chin Ophthal* 2015, 25: 197-200.
3. Zhao YW, Peng QH, Huang HT, et al. Clinical Study of Yiqi Jianpi Decoction for Treatment of Pseudostomyopia in Adolescents. *Chin J Chin Ophthal* 2011, 21: 147-150.
4. Wu YC. Application of Longdan Xiegan Decoction in ophthalmology. *Henan Tradit Chin Med* 2003: 57-58.
5. Chen LQ. The evaluation on the treatment of benign primary blepharospasm by acupuncture of "strengthening spleen and distributing liver" method. *Int J Trad Chin Med* 2014, 36: 307-310.
6. Ruan JY, Chen XH. Experience of Chen Xuhong on treatment of children's frequent blinking by Qianzheng Powder. *Chin J Chin Ophthal* 2016, 26: 347-349.
7. Song JK, Tian QM, Lu DL, et al. Clinical study on treatment of chronic uveitis with Qinghuo Rougan Mingmu formula. *Chin J Chin Ophthal* 2017, 27: 158-162.
8. Chen JF, Hong M, Shi TY. Shaoyao Qinggan Powder in treating acute anterior uveitis. *Chin J Chin Ophthal* 2014, 24: 134-135.
9. Song Y, Zhan YJ, Gu JH. Effect of qingganmingmufang on intervention for the expression of cytokine mRNA in the patients with acute uveitis. *Chin J Chin Ophthal* 2005, 15: 129-131.
10. Zhang X, Zhang Q. Experiences on treatment of optic neuritis from liver. *Chin J Chin Ophthal* 2015, 25: 37-40.
11. Sai ZJ, Zhang LC, Cong Y, et al. The enlightenment of Dahuang Zhechong pill in ophthalmology clinic. *Chin J Chin Ophthal* 2009, 19: 286-287.
12. Peng J, Zeng ZC, Yao XI. Clinical Professor Peng Qinghua's clinical experience in the treatment of ophthalmic diseases. *Chin J Chin Ophthal* 2010, 20: 167-172.
13. Ma QY, Yang YX, Liu QQ. Traditional Chinese medicine on primary open-angle glaucoma: a meta analysis. *Chin J Chin Ophthal* 2018, 28: 397-403.
14. Yang BF Su DF. Pharmacology. Beijing: People's Medical Publishing House, 2013.
15. Li X, Wu JJ. Analysis on drug using regularity treating diabetic retinopathy based on neoteric literature. *Chin J Chin Ophthal* 2014, 24: 123-129.