

Polycystic Ovary Syndrome-Related Infertility Based on the Theory of “Liver and Kidney Homology”

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Abstract: Polycystic ovary syndrome (PCOS) is an endocrine disorder caused by hypothalamic-pituitary-ovarian (HPO) axis dysfunction. In the field of gynecology and reproduction, PCOS has emerged as both a research hot spot and a challenging area of study. According to Chinese medicine, this disease is related to kidney deficiency, phlegm and dampness obstruction, blood stasis and interconnection, Chong pulse impassability, the lack of Ren pulse, and the loss of uterine nourishment, all of which affect the normal development and maturation of eggs as well as the duration at which menstrual blood stores. In this paper, based on the theoretical basis of “liver collects blood, regulates the flow of qi, and is the master of drainage,” we explore the rationality of the treatment of this disease from the perspective of “liver and kidney have the same origin” and the development of PCOS-related infertility in relation to dysfunctional internal organs. We also explore the feasibility of treatment from the perspective of “liver and kidney homology,” expand the ideas for treatment, as well as develop and innovate the application of organ identification in PCOS in relation to infertility.

Keywords: Polycystic ovary syndrome; Infertility; Liver and kidney homology; Dialectical treatment

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1. Introduction

Polycystic ovary syndrome (PCOS) is a gynecologic/reproductive endocrine disorder that causes sporadic ovulation or persistent anovulation due to hypothalamic-pituitary-ovarian (HPO) axis dysfunction. PCOS is a significant yet challenging gynecological disorder ^[1,2]. The clinical hallmarks of PCOS are hyperandrogenism, sporadic ovulation or anovulation, and polycystic ovarian changes (≥ 12 follicles in both ovaries) ^[3]. However, there is no record of PCOS in Chinese medicine, but according to its clinical manifestations, it can be classified as “infertility,” “amenorrhea,” “late menstruation,” or “obstruction” ^[5]. Through literature review, we explain the mechanism of PCOS-related infertility in Chinese medicine based on several theories, including “kidney is the origin of the innate nature and the master of reproduction” and “liver collects blood, regulates the flow of qi, and is the master of drainage,” in combination with the understanding of Chinese medicine and modern research. We also analyze the theoretical basis and practical value of this disease from the perspective of “liver and kidney have the same origin,” which provides ideas for the clinical treatment of this disease in traditional Chinese medicine (TCM).

2. Theoretical basis

2.1. Mutual generation of essence and blood

The kidney collects essence and is the main source of reproduction. It is the foundation of the Chong and Ren and is closely associated with pregnancy [6]. The kidney is the source of Tiangui, and Tiangui, as a yin essence that promotes the reproductive function of the body, is endowed innately. However, the water and grain essence of the latter gradually enriches it. The essence in the kidney is abundant. When Tiangui is sufficient through accumulation, it is secreted, making smooth Ren and Chong channels that are full of qi and blood. Menstrual blood gradually accumulates and moves into the uterus at the right time. The kidney is the root of qi and blood. It is connected to the brain and uterus and is responsible for menstrual blood production and fetal conception [7].

The liver collects blood, governs the sea of blood, and regulates Chong and Ren. The liver is a “blood organ,” where blood is collected and injected into the sea of blood of rushing veins and stored in the uterus; menstruation then occurs according to the time. In addition, the liver meridian of the liver channel circles the yin organ and contacts the Chong and Ren channels via the lesser abdomen. Chong represents the sea of blood, while Ren is associated with reproduction [8].

Both essence and blood originate from the essence of water and grain. Essence transforms into marrow, marrow produces blood, and blood nourishes the essence, as stated in “Reading Medical Essays,” “Essence is made of the essence of blood” [9]. Blood is the material basis for menstruation, pregnancy, fetus, childbirth, and breastfeeding. The transformation of blood is made possible by the vitalization of essence in the kidney; the fullness of essence in the kidney is essential for the moistening and nourishment of blood. Both essence and blood mutually nourish and transform each other, so that there is sufficient essence for blood to flourish and blood is full of essence to maintain its flow, and subsequently menstruation. The kidney collects essence, and the liver collects blood. The essence in the kidney is abundant, and the blood in the liver is sufficient. When qi and blood are balanced and sufficient, a child can be conceived through sexual intercourse between a man and a woman. In pathological states, there is lack of kidney essence and liver blood; essence does not transform into blood, and blood does not nourish the liver; when the two interact with each other, infertility occurs. Therefore, when treating such patients, it is necessary to focus on treating the liver and kidneys together as well as nourishing essence and blood.

2.2. Reciprocal use of the liver and the kidney

The liver is responsible for draining qi and regulating emotions. Normal qi and blood is essential for emotional and spiritual activities. On the contrary, internal injuries and disorders related to physical, mental, and emotional states are caused by disorders in the functioning of essence of internal organs, qi, and blood. The liver in the will is anger, and anger hurts the liver. Liver has an important role in the regulation of emotions because it is the master of drainage. A similar statement was also made in “Good formula for women”: “Infertility in women is due to the evil of the six sexes and the seven emotions, with injuries to the ramifications...” The statement implies that the seven internal injuries or emotional disorders, or the eagerness to have a child, will result in liver qi stagnation, uncontrolled drainage, depression and fire, discordance of qi and blood, and the hypofunction of Chong and Ren channels, which will lead to amenorrhea and even the inability to ejaculate or conceive. If liver qi stagnates for too long and qi becomes stagnant, blood does not flow smoothly and yin blood moves into the uterus; if liver wood offends the spleen and injures the spleen yang, the spleen loses its ability to transport and transform, dampness collects and becomes phlegm, and phlegm and dampness stagnate in the uterus; in that case, menstrual blood is not discharged smoothly or at the right time, resulting in late menstruation, reduced flow, or even amenorrhea; if the sperm and egg do not unite due to stasis in the uterus, infertility occurs [10].

The kidney is the main organ of dormancy and the essence of sperm and blood. Detached sperm passages and an imbalanced sealing function of the kidney may cause infertility, miscarriage, and leakage [11]. The kidney is the mother organ, while the liver wood is the child. The “child” tends to drain the “mother’s” qi. If the fire of reverting yin moves, the seal will not be in control, there will be a lack of kidney qi, and both essence and blood will leak. The seal and the collection and drainage, with one being static and the other dynamic, open and close in an orderly manner. Together, they regulate the onset of menstruation and the normal release of eggs, so that the eggs may be transported as scheduled.

2.3. Yin and yang undertaking control

Kidney yin and kidney yang, with one being static and the other dynamic, are united in opposition, promoting yet restraining one another, maintaining the balance and harmony of yin and yang, as well as regulating the functional activities of the body. If kidney yin is insufficient, lacks nourishment, or depleted with chronic disease, or yang cannot be controlled due to yin deficiency or there is a lack of nourishment to the uterus, source of heavenly sebum, or the sea of blood, then the phase fire will be hyperactive. The heat will affect the ramification, delay the Tiangui, cause late menstruation, light period, or even amenorrhea, and also prevent conception by affecting the sperm. If the endowment is weak, yang body is deficient, kidney yang is insufficient to control yin, and cold deficiency is internally generated, then the ramus and uterus will lose their warmth and the Tiangui does not flourish, thus resulting in infertility [12].

3. Detection and treatment

3.1. Tonify the liver and kidney, nourish yin and reduce fire

A woman with liver blood deficiency, kidney yin and essence depletion, essence and blood deficiency, lack menstrual blood source, and loss of uterine nourishment may not menstruate on time. Zuo Gui Wan, Yang Jing Zhong Yu Decoction, and Bu Shen Yang Jing Decoction are commonly used to nourish the liver and kidney as well as nourish yin and reduce fire to achieve therapeutic effects. Hao *et al.* [13] have treated PCOS patients with cycle therapy by tonifying the kidney, nourishing the essence, and activating blood stasis, *i.e.*, prescribing tonifying kidney and nourishing essence soup to women in premenstrual and postmenstrual phases to nourish the liver, kidney, and essence and fill the marrow, so as to promote follicular development and maturation, and the secretion of progesterone to improve the luteal function, as well as provide a good environment for embryo implantation; prescribing activating blood soup to women in during menstruation to activate blood stasis and move qi to ensure that menstrual blood flows in a timely manner. The study has shown that the treatment of tonifying the liver and kidney, nourishing the essence and blood to regulate menstrual blood can improve hormone levels and the morphology of the internal genitalia in PCOS patients as well as promote the growth of endometrium, which will in turn promote follicular development and improve endometrial tolerance. Shen *et al.* [14] have formulated a kidney-and-essence-tonifying fertility soup based on the pathogenesis of “kidney yin deficiency, essence and blood deficiency, and qi and blood deficiency in the ramus” to increase the ovulation and pregnancy rates by improving the serum sex hormone levels, which have been clinically shown to improve polycystic changes and promote follicular development in PCOS patients. The above discussion suggests that the treatment of “tonifying the liver and kidney, nourishing Yin and reducing fire” can improve the symptoms and increase the conception rate in PCOS patients with kidney-yin deficiency and essence-blood deficiency.

3.2. Tonifying the kidney and draining the liver, regulating qi and resolving phlegm

Zhu *et al.* [15] have analyzed the distribution of TCM evidence on PCOS based on literature, among which 8.45% were of kidney deficiency and liver depression. Zeng *et al.* [16] have found that 14.24% of patients with PCOS have kidney deficiency and liver depression. Therefore, a deficiency in the function of the

kidney and excess catharsis of the liver will cause insufficient kidney essence and qi stagnation. On the other hand, if liver fire refines liquid into phlegm or liver wood offends the spleen, the spleen will not be able to transport the phlegm, and the dampness will accumulate to become phlegm, which will block the uterus, thus causing amenorrhea. The method used to treat kidney deficiency and liver depression in PCOS is to tonify the kidney, drain the liver, regulate qi, and resolve phlegm. The formula is as such: Gentian Diarrhea Liver Soup and Danzhi Xiaoyao Powder, with the addition of Zuo Gui Wan and Er Chen Tang to achieve long-term effects. In a study, Zheng *et al.* ^[17] treated patients with PCOS-related infertility using Zuo Gui and Shugan Bushen Decoction plus reduction. The treatment was effective in treating their symptoms caused by emotional factors and improving their serum luteinizing hormone (LH), follicle-stimulating hormone (FSH), testosterone (T), and estradiol (E2) levels. It can be seen that the method of “tonifying the kidney and draining the liver, regulating qi and resolving phlegm” is effective in treating this disease. It improves the patients’ clinical symptoms and reduces the levels of sex hormones (serum testosterone and LH).

3.3. Warming the kidney and helping Yang, warming the uterus and eliminating symptoms

If kidney yang is deficient, the uterus will lose its warmth and cold will coagulate in the uterus, resulting in infertility and blood stagnation. If the yang is deficient and unable to transport blood, the blood deficiency and cold coagulation will lead to abdominal mass. In a study, Ma *et al.* ^[18] recruited 116 infertile patients with PCOS due to kidney-yang deficiency and prescribed a formula to regulate menstruation, Yulin Tongguan Decoction, in addition to clomiphene citrate capsules and estradiol valerate tablets. This formula can improve endocrine disorders, increase endometrial tolerance, and assist the implantation of fertilized eggs, thus treating infertility. In another study, Wang *et al.* ^[19] used a combination of Chinese and Western medicine to treat follicular development disorders due to kidney yang deficiency in PCOS. The formula used was as follows: Wenchao Decotion, combined with yin and yang of menstrual cycle to warm the uterus and promote pregnancy. In clinical practice, the application of “warming the kidney to promote yang, warming the uterus to eliminate symptoms” has been effective in treating patients with infertility due to kidney-yang deficiency.

4. Conclusion

The clinical manifestations of PCOS are complex and varied. The treatment for PCOS varies from person to person. With Western medicine alone, there may be many side effects and the efficacy may not be significant. As shown by several clinical observations, the treatment effect from the combination of TCM and Western medicine is better than that of Western medicine alone. Here, we briefly elaborate the concept of “liver and kidney homology” to provide some theoretical basis for future clinical treatment. In future studies and research, we should systematically improve our theoretical knowledge, beginning from the identification of evidence, grasping the core, formulating corresponding treatment plans for individuals of different ages, adopting the idea of stage-based treatment, and understanding the essence of clinical evidence-based treatment.

Disclosure statement

The authors declare no conflict of interest.

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