

Research Progress on Traditional Chinese Medicine Intervention for Diminished Ovarian Reserve

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Abstract: *Diminished Ovarian Reserve (DOR) is a significant clinical issue that leads to decreased fertility in women and has been increasingly prevalent in recent years. While conventional Western medicine relies on ovulation induction and assisted reproductive technologies to improve pregnancy rates, these methods face challenges such as long treatment durations, significant side effects, and high costs. In contrast, Traditional Chinese Medicine (TCM) approaches to treating DOR, guided by theories such as "the kidney governing reproduction" and "the harmonization of Chong and Ren meridians," emphasize "syndrome differentiation and individualized treatment" and "holistic regulation." TCM demonstrates unique advantages in enhancing ovarian function, improving endocrine balance, and regulating emotions. This article systematically reviews the understanding of the etiology and pathogenesis of DOR in TCM, the characteristics of syndrome differentiation and typing, the mechanisms and therapeutic effects of herbal interventions, as well as the application progress of TCM-specific therapies such as acupuncture, moxibustion, medicinal fumigation, and foot baths. It also integrates modern medical research to validate their mechanisms of action and clinical value. TCM therapies not only provide safe and effective treatment options for patients with DOR but also offer theoretical foundations and practical directions for optimizing the management of women's reproductive health through the integration of traditional and Western medicine.*

Keywords: Diminished Ovarian Reserve (DOR), TCM, Syndrome differentiation, Individualized treatment.

1. Introduction

Diminished Ovarian Reserve (DOR) refers to a clinical condition in which the number of oocytes in the ovaries decreases or the quality of oocytes deteriorates, leading to reduced fertility in women. Its core characteristics include abnormal indicators such as decreased levels of anti-Müllerian hormone, reduced antral follicle count, and elevated basal follicle-stimulating hormone [1]. Although DOR can occur in women of any age, it is particularly common in older women and is often closely related to reproductive issues such as infertility, menstrual disorders, and failed embryo implantation. With the acceleration of social pace, delayed marriage and childbirth, as well as the combined effects of environmental pollution and psychological stress, the incidence of DOR among women of childbearing age has been increasing year by year. Statistics show that the prevalence of DOR among women of childbearing age in China is about 10% to 35%, and it exceeds 50% in women over 40 years old, becoming an important issue that urgently needs to be resolved in the field of reproduction [2-3].

Currently, Western medicine primarily relies on ovulation-inducing drugs and assisted reproductive technologies (ART) to treat DOR. Although these methods have achieved certain success in improving the pregnancy rates of some patients, they still face issues such as high intensity of cycle stimulation, uncertain success rates, high costs, and drug side effects, making it difficult to form a personalized and long-term effective treatment model. In particular, for women with gradually declining reproductive function, over-reliance on technical means often leads to anxiety and disappointment, and does not truly achieve fundamental improvement in physical function [4-5]. Therefore, exploring alternative treatment methods that are safe, gentle, and have holistic regulatory effects has become a key direction in the development of modern reproductive

medicine.

The unique value of Traditional Chinese Medicine (TCM) in the treatment of DOR has gradually attracted attention. From the perspective of TCM theory, ovarian dysfunction is often related to "kidney deficiency," "spleen weakness," and "insufficient qi and blood." The treatment principle emphasizes "nourishing the kidneys and essence, strengthening the spleen and harmonizing the blood," aiming for the coordination of yin and yang and the harmonization of the Chong and Ren meridians [6]. In recent years, numerous studies have confirmed that traditional Chinese medicines such as Zishen Yutai Pill, Kuntai Capsule, and Zogui Pill have positive therapeutic effects in improving oocyte quality, regulating endocrine function, and enhancing the ovarian microenvironment. Acupuncture and moxibustion, characteristic TCM therapies, have also shown significant effects in assisted reproductive cycles [7]. Compared with the "interventional treatment" of Western medicine, TCM advocates "adjusting according to the trend," emphasizing long-term regulation and the integration of physical and mental treatment. This not only enhances patient compliance but also reflects the practical significance and broad prospects of traditional medicine in modern reproductive health.

2. Diminished Ovarian Reserve from the Perspective of Western Medicine

Diminished Ovarian Reserve (DOR) is a pathological condition characterized by a reduced number or quality of oocytes in the ovaries, leading to decreased fertility in women. Its etiology is multifactorial, encompassing age-related natural degeneration, genetic factors, autoimmune reactions, iatrogenic damage, and environmental and lifestyle influences. As age advances, the number of follicles declines, and the quality of oocytes deteriorates, manifesting as reduced mitochondrial function and increased chromosomal abnormalities [8]. Additionally, mutations or polymorphisms

in certain genes, such as FMR1, GDF9, and FSHR, have been linked to impaired follicle development. Abnormal immune responses can also lead to chronic inflammatory reactions in ovarian tissue, accelerating ovarian decline. Iatrogenic factors, including ovarian surgery and chemoradiotherapy, can directly damage ovarian tissue, depleting the follicle pool. Unhealthy lifestyle habits, such as smoking, poor sleep, and high psychological stress, similarly contribute to ovarian aging and the rising incidence of DOR. Pathophysiologically, patients with DOR exhibit reduced ovarian responsiveness to gonadotropins, slow or arrested follicle development, fluctuating estrogen levels, ovulation disorders, and menstrual cycle irregularities, all of which severely impact embryo quality and implantation success rates [9].

In clinical diagnosis, Western medicine primarily relies on several endocrine and imaging indicators to assess ovarian reserve function. Anti-Müllerian hormone (AMH), secreted by preantral follicle granulosa cells, is a stable reflection of the ovarian follicle pool and is one of the most sensitive assessment indicators [10]. AMH levels are not affected by the menstrual cycle, and values below 1.1 ng/ml typically suggest diminished ovarian reserve. Follicle-stimulating hormone (FSH) is usually measured on days 2 to 4 of the menstrual cycle; elevated basal FSH levels (commonly >10 IU/L) indicate poor ovarian response to hormonal stimulation. However, FSH is subject to estrogen feedback regulation and can fluctuate significantly, necessitating evaluation in conjunction with other indicators. Additionally, antral follicle count (AFC) measured by transvaginal ultrasound is an effective means of assessing ovarian function, with counts fewer than 5–7 follicles indicating limited follicle reserve [10]. These indicators must be integrated with patient age, medical history, and hormonal levels to form a more accurate diagnostic conclusion.

In terms of treatment, Western medicine mainly employs controlled ovarian stimulation and assisted reproductive technologies (ART). Ovulation induction protocols include long protocols, short protocols, and GnRH antagonist protocols, aimed at increasing the number of follicles and improving embryo quality [11]. To address poor ovarian response, mild stimulation protocols have gradually been adopted in clinical practice to reduce drug burden and lower the risk of ovarian hyperstimulation syndrome. Assisted reproductive technologies, such as in vitro fertilization and intracytoplasmic sperm injection, have made certain progress in improving pregnancy rates for some patients. To address oocyte quality issues, adjuvant drugs like growth hormone, dehydroepiandrosterone, and coenzyme Q10 are used to enhance mitochondrial function and embryonic developmental potential. Additionally, fertility preservation measures, such as oocyte cryopreservation for high-risk populations, are becoming routine [12]. However, these treatment modalities still have many limitations: some DOR patients fail to achieve sufficient follicle recruitment even with high doses of gonadotropins; oocyte quality is closely related to age and is irreversible; treatment protocols are difficult to standardize due to significant individual variability; and the high costs and psychological stress from repeated failures also affect patient treatment willingness and compliance [13]. Therefore, although Western medical treatments for DOR are continuously evolving in terms of

technology, they still fall short in overall effectiveness and long-term regulation, urgently necessitating safer, more economical, and sustainable intervention methods.

3. TCM's Understanding of Insufficient Ovarian Reserve Function

3.1 TCM Etiology and Pathogenesis

Although insufficient ovarian reserve function is a modern medical disease, its clinical manifestations are closely related to TCM gynecological diseases such as “late menstruation”, “oligomenorrhea”, “amenorrhea”, and “infertility”. The core of TCM etiology and pathogenesis is “kidney deficiency as the root”, and it is often accompanied by multiple pathological factors such as liver depression, spleen deficiency, phlegm dampness, and blood stasis, forming a complex pathogenesis network [14].

(1) Kidney deficiency as the root, loss of essence and qi

The kidney is the “innate root”, responsible for reproduction, storage of essence, and control of water. When the kidney essence is full, the heavenly essence arrives, the Chong and Ren meridians are unblocked, and menstruation comes on time. Most DOR patients have insufficient kidney essence, which leads to the failure of heavenly essence to arrive, Chong and Ren meridians to be unbalanced, and uterine malnutrition, manifested as scanty menstruation, prolonged menstruation, amenorrhea, and infertility. People with kidney yin deficiency often have hot flashes, night sweats, and dry mouth and throat; people with kidney yang deficiency have chills, cold limbs, and sore waist and knees. Modern research has also confirmed that kidney deficiency is closely related to dysfunction of the hypothalamus-pituitary-ovarian axis [15].

(2) Liver depression and qi stagnation, and dysfunction of qi regulation

The liver is responsible for qi regulation and regulating qi. Liver qi stagnation leads to qi stagnation and blood stasis, obstruction of Chong and Ren channels, and malnutrition of the uterus. Modern women are often emotionally upset and under great pressure. Liver qi stagnation is often accompanied by kidney deficiency, forming a syndrome of “liver depression and kidney deficiency”. Liver depression can cause irregular menstruation, breast swelling, and mood swings. In severe cases, it can affect follicular development and ovulation function [16].

(3) Spleen deficiency and phlegm dampness, insufficient qi and blood biochemical transformation

The spleen is the “foundation of acquired constitution” and is responsible for transporting water and grain, and qi and blood biochemical transformation. Spleen deficiency leads to insufficient source of qi and blood biochemical transformation, and malnutrition of the uterus, which is manifested as scanty menstruation, prolonged menstruation, fatigue and loss of appetite. Spleen deficiency generates dampness, which gathers into phlegm. Phlegm and dampness block Chong and Ren channels, which can also affect the ovarian microenvironment and hormone secretion,

aggravating the condition of DOR [17]. (4) Blood stasis blocks collaterals and uterine malnutrition

Blood stasis is one of the common pathological factors of DOR. Kidney deficiency can lead to poor blood flow, resulting in blood stasis blocking the Chong and Ren meridians and the uterus, which manifests as poor menstruation, abdominal pain that refuses to be pressed, and purple tongue or petechiae. Blood stasis affects the local blood supply to the ovaries, leading to delayed follicular development and decreased embryo quality [18].

(5) Heart-kidney disharmony, blocked uterine vessels

Traditional Chinese medicine believes that "the uterine vessels belong to the heart and collateralize in the uterus". The heart governs blood vessels and the kidney governs reproduction. When the heart and kidney are connected, water and fire are in harmony and menstruation is normal. If the heart qi cannot flow down to the kidney, the uterine vessels are blocked, and symptoms such as late menstruation, amenorrhea, and infertility will occur. Modern studies have also found that emotional disorders are closely related to DOR, suggesting that heart-kidney disharmony cannot be ignored in the pathogenesis. In summary, the TCM etiology and pathogenesis of DOR is based on kidney deficiency, which is often accompanied by liver depression, spleen deficiency, phlegm dampness, blood stasis and other factors, forming the pathological characteristics of "fundamental deficiency and superficial excess". Treatment should be based on the overall situation, syndrome differentiation and treatment, harmonizing the functions of the internal organs, and improving the Chong and Ren meridians and the uterus environment [19].

3.2 TCM Syndrome Differentiation and Treatment System and Classification Characteristics

TCM syndrome differentiation and treatment emphasizes "adapting to individual needs and treating according to syndrome", which is particularly important in the treatment of DOR. According to the patient's constitution, symptoms, tongue and pulse manifestations, etc., it can be divided into multiple syndromes, and each syndrome corresponds to a different treatment strategy [7]. Patients with insufficient ovarian reserve (DOR) often show multiple syndromes in the TCM syndrome differentiation system, and treatment should be individualized according to specific syndromes. Common symptoms of kidney yin deficiency syndrome include scanty menstruation, prolonged menstrual cycle, hot flashes and night sweats, etc., and it is advisable to nourish yin and tonify the kidney, such as Liuwei Dihuang Pills and Zuogui Pills; kidney yang deficiency syndrome is mainly characterized by chills, cold limbs, and sore waist and knees. It can be warmed with yang and benefit essence, and Yougui Pills or Jinkui Shenqi Pills can be used. If depression, breast swelling, and irregular menstruation are accompanied by symptoms of liver depression, it is a syndrome of liver depression and kidney deficiency. It is advisable to soothe the liver and relieve depression, nourish the kidney and nourish the blood. Representative prescriptions include Jiawei Xiaoyao Powder and Tiaojing Decoction. The syndrome of spleen and kidney deficiency is characterized by fatigue, loss of appetite, and

sallow complexion. It is advisable to strengthen the spleen and replenish qi, and replenish the kidney and replenish essence, such as Shenling Baizhu Powder combined with Liuwei Dihuang Pills [15]. Kidney deficiency and blood stasis will cause menstrual disorder and abdominal pain that refuses to be pressed. It is advisable to nourish the kidney and activate blood circulation, and remove blood stasis and dredge the collaterals, such as Taohong Siwu Decoction combined with Yougui Pills [18]. Patients with liver and kidney yin deficiency often show symptoms such as dizziness, tinnitus, hot flashes, and sweating. It is advisable to nourish the liver and kidney, nourish yin and clear heat. Zhibai Dihuang Pills and Erzhi Pills can be used. If both yin and yang are deficient, and chills and hot flashes occur alternately, it is a syndrome of kidney yin and yang deficiency. It is advisable to supplement both yin and yang, such as Erxian Decoction and Zuoyougui He Fang. Modern research indicates that the core pathogenesis of DOR patients is kidney deficiency, which is often accompanied by liver depression, blood stasis, spleen deficiency and other syndromes. Syndrome differentiation not only helps to improve the accuracy of treatment, but also provides a basis and clinical guidance for the scientific selection of Chinese medicine prescriptions.

3.3 TCM Holistic Conditioning Concept: "Regulating Kidney Qi and Harmonizing Chong and Ren"

TCM treatment of insufficient ovarian reserve (DOR) not only focuses on the functional recovery of the ovaries themselves, but also emphasizes the coordination and conditioning of the reproductive system as a whole, especially the intrinsic connection between kidney qi, Chong and Ren, Tiangui and the uterus. TCM believes that the normal operation of female reproductive function depends on "full kidney essence, unobstructed Chong and Ren, timely Tiangui, and nourishment of the uterus", so "regulating kidney qi and harmonizing Chong and Ren" has become the core concept of treating DOR.

(1) Kidney qi is the foundation, and essence is full

The kidney is the "innate foundation", which controls reproduction, stores essence, and controls water. The fullness of kidney essence is the basis for the generation of Tiangui. The Suwen Shanggu Tianzhen Lun states: "When a woman is 27 years old, the menstruation arrives, the Ren channel is unblocked, the Taichong channel is strong, and menstruation comes on time." If the kidney essence is sufficient, the Chong and Ren channels will be strong, menstruation will be regular, and fertility will be strong. Most DOR patients show symptoms of kidney essence deficiency, which leads to insufficient Tiangui, Chong and Ren channels imbalance, and uterine malnutrition, which ultimately affects follicular development and ovulation function. Therefore, replenishing the kidney and replenishing essence and regulating kidney qi are the fundamental treatments [15].

(2) Chong and Ren channels are unblocked, and the uterus is nourished

The Chong and Ren channels are the key channels of female reproduction. The Chong channel is the "sea of blood" and the Ren channel is the "fetus". The two channels control

menstruation and pregnancy functions. Kidney essence deficiency, liver depression and qi stagnation, phlegm and dampness blocking the collaterals, etc. can all lead to Chong and Ren channels being unblocked and uterine malnutrition, which manifests as scanty menstruation, irregular menstruation, and infertility. TCM treatment emphasizes "regulating the Chong and Ren meridians" and improves the blood supply and internal environment of the uterus through methods such as promoting blood circulation and removing blood stasis, soothing the liver and regulating qi, and strengthening the spleen and removing dampness, thereby promoting follicle development and hormone secretion [16].

(3) Regulating the uterus and stabilizing the cycle

Tianguai is a physiological substance produced by kidney essence, which is responsible for women's menstruation and fertility. The rise and fall of tianguai directly affects ovarian function and menstrual cycle. If kidney essence is insufficient, tianguai will not come, menstruation will be irregular, and fertility will decrease. TCM regulates kidney essence, nourishes yin and yang, and regulates qi and blood to enable the normal production and operation of tianguai, thereby stabilizing the menstrual cycle and improving ovarian reserve function [17].

(4) Regulating emotions and harmonizing body and mind

TCM emphasizes that "the heart governs the mind and the liver governs the release of qi". Emotional disorders can lead to liver qi stagnation, which in turn affects the function of the Chong and Ren meridians and the uterus. Modern women have a fast pace of life and high pressure, and are prone to emotional problems such as anxiety and depression, which in turn aggravate the condition of DOR. During the treatment process, attention should be paid to regulating emotions, and through methods such as soothing the liver and relieving depression, calming the mind and nourishing the heart, the psychological state can be improved to enhance the treatment effect [18].

(5) Diet and daily life, auxiliary conditioning

A reasonable diet and lifestyle are important components of TCM overall conditioning. It is recommended that DOR patients avoid cold, spicy, and greasy foods, and appropriately consume foods rich in high-quality protein, vitamins, and trace elements, such as black beans, wolfberries, yam, walnuts, etc., to nourish the kidneys and nourish the essence, strengthen the spleen and replenish qi. At the same time, maintaining a regular work and rest schedule, exercising moderately, avoiding staying up late and overwork, can help strengthen the body and improve ovarian function [7].

(6) Individualized treatment, syndrome differentiation and treatment

TCM treatment of DOR emphasizes "different for different people", and formulates personalized treatment plans based on the patient's constitution, etiology, and syndrome type. For example, patients with kidney yin deficiency should nourish yin and tonify the kidney, patients with kidney yang deficiency should warm yang and benefit essence, patients

with liver depression should soothe the liver and relieve depression, patients with phlegm and dampness should strengthen the spleen and eliminate dampness, and patients with blood stasis should promote blood circulation and dredge the collaterals. Through syndrome differentiation and treatment, the treatment goal of "regulating kidney qi and harmonizing Chong and Ren meridians" can be achieved, thereby improving ovarian function and fertility [8].

4. The Auxiliary Role of TCM Characteristic Treatments

The role of TCM external treatment in the treatment of DOR is becoming increasingly prominent, especially in improving ovarian blood supply, regulating endocrine, and alleviating psychological disorders.

4.1 Application and Mechanism of Acupuncture Treatment

Acupuncture can regulate the hypothalamus-pituitary-ovarian axis and improve follicular development if the acupoints are selected accurately. Commonly used acupoints in clinical practice include Guanyuan, Qihai, Shenshu, Sanyinjiao, etc. Studies have shown that acupuncture can increase AMH and E2 levels and promote natural pregnancy and successful assisted reproduction. Its mechanism of regulating neurotransmitters and central endocrine responses has also been gradually confirmed [21].

4.2 Comprehensive Intervention Effect of TCM External Treatment

Including moxibustion, medicinal fumigation, foot bath and other methods, which can warm the kidney and improve local blood supply. Among them, moxibustion Guanyuan and Mingmen can warm the yang and tonify the kidney, medicinal fumigation helps to improve the uterine environment, and foot bath is suitable for home conditioning. These methods are simple to operate and have stable effects. They have good effects before and after the assisted reproduction cycle [23].

4.3 Integrated application model of combined therapy

The combination of TCM characteristic therapy with traditional Chinese medicine and Western medicine technology forms an integrated medical model, which has been widely verified in clinical practice. Traditional Chinese medicine combined with acupuncture improves the quality of follicles, traditional Chinese medicine combined with moxibustion improves the uterine cold constitution, and traditional Chinese medicine combined with IVF cycle can significantly improve the success rate of pregnancy. This kind of integrated program not only improves the efficacy, but also enhances the comfort and psychological support of patients.

5. Conclusion

As a key factor affecting the fertility of women of childbearing age, insufficient ovarian function reserve has become a clinical challenge that cannot be ignored in the field of reproductive medicine. Although current Western medicine treatment has technical advantages, it still has shortcomings in long-term efficacy and individualized conditioning. In DOR

intervention, traditional Chinese medicine adheres to the core concept of "regulating the kidney and nourishing essence, and treating according to syndrome differentiation", integrating internal and external treatment, physical and mental conditioning and life intervention, and forming a complete intervention system. Under the synergistic effect of characteristic therapies such as traditional Chinese medicine and acupuncture, not only the quality of follicle development and pregnancy rate are improved, but also the overall health level and psychological state of patients are significantly improved. In the future, we should further strengthen the basic research and multi-center evidence-based clinical verification of TCM intervention mechanisms, and promote the normalization, standardization and modernization of TCM in the field of women's reproductive health. At the same time, the construction of a synergistic treatment model of Chinese and Western medicine will hopefully provide a more scientific and systematic solution for the comprehensive intervention of complex diseases such as DOR, and safeguard the reproductive health of the majority of women.

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