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SERBIAN ARCHIVES
OF MEDICINE

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Paper Accepted* **ISSN Online 2406-0895**

Original Article / Оригинални рад

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Efficacy of Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine on polycystic ovary syndrome with kidney yang deficiency – a randomized controlled trial

Ефикасност моксибустије Шаођоншен ватреног змаја у комбинацији са традиционалном кинеском медицином на синдром полицистичних јајника са недостатком јанга бубрега – рандомизовано контролисано испитивање

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Received: August 22, 2024
Revised: January 15, 2025
Accepted: February 17, 2025
Online First: February 24, 2025
DOI: https://doi.org/10.2298/SARH240822020Y

*__Accepted papers__ are articles in press that have gone through due peer review process and have been accepted for publication by the Editorial Board of the *Serbian Archives of Medicine*. They have not yet been copy-edited and/or formatted in the publication house style, and the text may be changed before the final publication.
Although accepted papers do not yet have all the accompanying bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: the author's last name and initial of the first name, article title, journal title, online first publication month and year, and the DOI; e.g.: Petrović P, Jovanović J. The title of the article. Srp Arh Celok Lek. Online First, February 2017.
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SUMMARY

Introduction /Objective To investigate the efficacy of Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine on polycystic ovary syndrome (PCOS) with kidney yang deficiency.

Methods 80 patients with kidney yang deficiency type PCOS admitted were selected and randomly divided into the control group and the intervention group, with 40 patients in each group. The control group was given routine nursing care and traditional Chinese medicine (TCM) treatment, and the intervention group was treated with Xiaozhoutian fire dragon moxibustion based on the control group. After three months, the therapeutic effects of the two groups were compared by TCM symptom score, menstrual condition and serum sex hormone level.

Results Patients in the intervention group showed a significant improvement in the TCM symptom score compared with the control group after treatment; menstrual conditions such as duration of menstrual period, menstrual flow, degree of dysmenorrhea, and blood clots, and serum sex hormone levels such as luteinizing hormone (LH), follicle-stimulating hormone (FSH), luteinizing hormone/follicle-stimulating hormone ratio (LH/FSH), estradiol (E_2), testosterone (T), and progesterone (P) were all better than those in the control group, and the difference was statistically significant ($p < 0.05$); the total effective rate of treatment for patients in the intervention group reached 92.50%, which was significantly higher than that of 72.50% of the control group ($p < 0.05$).

Conclusion Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine has good clinical efficacy in treating PCOS with kidney yang deficiency, which can improve the symptoms and hormone level of patients and improve the quality of body.

Keywords: Xiaozhoutian fire dragon moxibustion; traditional Chinese medicine; kidney yang deficiency syndrome; polycystic ovary syndrome; randomized controlled study

САЖЕТАК

Увод /Циљ Истражити ефикасност Шаођоншен моксибустије ватреног змаја у комбинацији са традиционалном кинеском медицином на синдром полицистичних јајника (ПЦОС) са недостатком јанга бубрега.

Методе Одабрано је 80 пацијената са јанг дефицијентом бубрега типа ПЦОС и насумично подељено у контролну и интервентну групу, са по 40 пацијената у свакој групи. Контролна група је добила рутинску негу и третман традиционалне кинеске медицине (ТЦМ), а интервентна група је третирана мокибустијом Шаођоншен ватреног змаја на основу контролне групе. После три месеца, терапијски ефекти две групе су упоређени са резултатом симптома ТЦМ, менструалним стањем и нивоом полних хормона у серуму.

Резултати Пацијенти у интервентној групи показали су значајно побољшање у скору симптома ТЦМ у поређењу са контролном групом након третмана ($p < 0,05$); менструални услови као што су трајање менструалног периода, менструални ток, степен дисменореје и крвних угрушака и нивои полних хормона у серуму као што су лутеинизирајући хормон (ЛХ), фоликулостимулирајући хормон (ФСХ), однос лутеинизирајућег хормона/фоликулостимулирајућег хормона (ЛХ/ФСХ), естрадиол (Е2), тестостерон (Т) и прогестерон (П) су сви били бољи од оних у контролној групи, а разлика је била статистички значајна ($p < 0,05$); укупна ефективна стопа лечења пацијената у интервентној групи достигла је 92,50%, што је више од оне од 72,50% у контролној групи ($p < 0,05$).

Закључак Мокибустија Шаођоншен ватреног змаја у комбинацији са традиционалном кинеском медицином има добру клиничку ефикасност у лечењу ПЦОС-а са недостатком јанга бубрега, што може побољшати симптоме и ниво хормона пацијената и побољшати квалитет тела.

Кључне речи: мокибустија Шаођоншен ватреног змаја; традиционална кинеска медицина; синдром недостатка јанг бубрега; синдром полицистичних јајника; рандомизована контролисана студија

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common reproductive endocrine disease in gynecology, which is characterized by hyperandrogenemia, ovulatory dysfunction, insulin resistance and ovarian polycystic changes, with the main clinical manifestations of scanty menstruation or amenorrhea, infertility, obesity, and hirsuteness, etc. [1]. In China, the incidence of PCOS can reach 5% to 10%, and tends to increase year by year. Ovulatory dysfunction infertility due to PCOS accounts for about 75% of anovulatory infertility and is one of the most common causes of infertility in women of reproductive age [2]. Currently, ovulation promotion and blood androgen lowering are mostly used in clinical treatment, which have certain efficacy, but are often associated with adverse effects such as follicular developmental disorders, multiple pregnancies, high miscarriage rates, and long treatment cycles with poor patient compliance [3, 4]. Currently, the United States Food and Drug Administration has not approved any therapeutic drugs specifically for PCOS, but some drugs commonly used in clinical practice, such as oral contraceptives, anti-androgen drugs, insulin sensitizers, and ovulation-inducing drugs, are prescription drugs and usually require an endocrinologist or gynecologist to evaluate and prescribe according to the patient's specific situation [5, 6]. In addition to the need for improved development of new drug molecules and new drug discovery, new drugs can be found through drug repurposing methods [7]. Given that PCOS is a growing problem, unfortunately with many unwanted complications that follow, and that the available methods and drugs are not 100% effective, it is important to study its pathogenesis and carefully identify new pharmacological targets.

Fire dragon moxibustion is also called "long snake moxibustion" or "Du moxibustion". It is mostly performed on the Du channel and bladder meridian on the back of the human body. It is a large area moxibustion method [8]. The Du channel is the sea of yang channels. Fire dragon

moxibustion performed on the sea of yang channels has a strong warming effect on the human body and is a "large moxibustion" method. Traditional fire dragon moxibustion generally selects the Du channel on the back and the bladder meridian on both sides. After a long period of clinical application and innovation, it has also been applied to the chest, abdomen, knee joints and other parts. Fire dragon moxibustion has the effects of local stimulation, regulating meridians, and improving immune function. The local stimulation effect is achieved through the warm stimulation generated by burning during moxibustion, which causes local skin congestion, capillary dilation, enhanced local blood circulation and lymphatic circulation, and enhanced metabolic capacity of local skin tissue, promoting the dissipation and absorption of pathological products such as inflammation, adhesion, exudate, and hematoma [9]; it can also cause the diffusion of inhibitory substances in the cerebral cortex, reduce the excitability of the nervous system, and exert a sedative and analgesic effect; the warming effect can promote the transdermal absorption of warming yang drugs, so that the warming and unblocking effects of moxa or powder can penetrate into the meridian acupoints of the Governor Vessel and the Bladder Meridian, which has the effect of invigorating yang; all the internal organs of the body have corresponding acupoints on the Governor Vessel. While moxibustion is performed, it can both control the yang of the whole body and regulate the internal organs of the whole body, with the effect of connecting the internal organs internally and connecting the limbs externally [10].

Based on the theory of traditional acupuncture and combining with the theory of Chinese medicine, Xiaozhoutian fire dragon moxibustion can treat any localized lesion from the overall qi to do the corresponding overall treatment and targeted lesion treatment. The overall qi treatment ensures the normal circulation of the body's overall qi, and the targeted lesion treatment ensures the healing of specific lesions. Xiaozhoutian fire dragon moxibustion is applied to the Du and Ren veins in the back and abdomen of the human body through the

warming effect of burning moxa and the efficacy of herbal medicine and wine, which has the effect of relaxing the tendons and activating the collaterals, warming yang and tonifying the kidneys, invigorating the spleen and nourishing the stomach, and regulating the yin and yang [11]. Its clinical application is mostly based on the syndrome differentiation and classification of the patient's symptoms. Different drugs are selected and matched, and with the help of the warming power of moxa and the thermal effect of fire, the "four-in-one" combination of acupuncture points, meridians, moxibustion, and drugs is achieved. It stimulates the body's healthy energy and drives away disease and pathogenic factors [8]. It is currently mainly used in lung diseases, joint diseases, gynecological diseases, spleen and stomach diseases and other systems [10]. For example, Chen et al [12] used a clinical randomized controlled study to compare fire dragon moxibustion with traditional Chinese medicine encapsulated hot compress in the treatment of ankylosing spondylitis with kidney deficiency and Du Cold type. Afterwards, the patient's pain, morning stiffness, symptoms and signs were significantly improved; Wen [13] used Fire Dragon Moxibustion combined with Hot Ampoule to treat COPD patients compared with conventional breathing. COPD patients treated with the disease not only improved their clinical symptoms but also improved their lung function; Yue et al [14] performed on 60 patients with primary dysmenorrhea. Fire dragon moxibustion has been found to improve the quality of life of sub-healthy women while treating diseases and has the effect of improving the patient's physical condition. According to the clinical manifestations of PCOS, it belongs to the categories of "late menstruation", "amenorrhea" and "infertility" in Chinese medicine [15]. A study by Huang [16] et al. evaluated the clinical effects of acupuncture combined with Western medicines and herbs that warm the yang and tonify the kidneys, strengthen the spleen and activate the blood in the treatment of PCOS. The results showed that the combined treatment approach was more effective in lowering serum testosterone, fasting insulin levels, luteinizing hormone/follicle-stimulating hormone ratios,

and in increasing ovulation rates than Western medicine alone.

According to the theories of "the liver and kidney have the same origin" and "the liver stores blood" [17], the traditional Chinese medicine formula used in this study was Shugan Yanggan Fuyang Tang, which is effective in warming yang, dispersing cold, nourishing the liver, and warming the kidneys. Tang is commonly used in the clinical treatment of PCOS in Traditional Chinese medicine (TCM), but few studies have used it together with Xiaozhoutian fire dragon moxibustion as a treatment program for PCOS patients with kidney-yang deficiency. Internal and external medications often complement each other, and combining Xiaozhoutian fire dragon moxibustion therapy with tonics can lead to better drug absorption and greater effectiveness. Therefore, this study takes this therapy as an entry point and adopts the research method of randomized controlled trial to explore the overall efficacy of Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine in the treatment of kidney-yang-deficient PCOS patients and the differences in the changes of relevant indicators. This provides a relevant basis for future clinical treatment and research, with a view to providing a novel and effective treatment option for this disease and diversified treatment choices for the broader kidney-yang deficiency PCOS group.

METHODS

Participants

This randomized controlled trial (RCT) was conducted from October 2022 to February 2024 at the First Affiliated Hospital of Nanchang University. Convenience sampling method was used to recruit PCOS patients. This study was approved by the ethics committee of the First Affiliated Hospital of Nanchang University (Approval number: (2024)CDYFYYLK(12-241).

Written informed consent was obtained from all participants. In addition, voluntary participation and confidentiality of responses were assured.

Randomization and blinding

Random numbers were generated by IBM SPSS Statistics (Version 26.0, IBM Corp, Armonk, NY, USA). The corresponding allocation schemes were saved by the researchers into opaque airtight envelopes. Participants entering the trial opened the envelopes in the order of enrollment and received treatment in the corresponding group according to the allocation scheme in the envelopes. 80 PCOS patients with kidney yang deficiency who met the inclusion criteria were divided into control group and intervention group, 40 patients in each group.

Diagnostic criteria

Western medical diagnostic criteria: refer to the diagnostic criteria of the European Society of Human Reproduction and Embryology/American Society for Reproductive Medicine [18]: (a) scanty menstruation or amenorrhea or irregular uterine bleeding; (b) clinical hyperandrogenism or hyperandrogenemia, such as hirsutism, obesity, etc; (c) ultrasonography suggests that the ovary is polycystic changes. The diagnosis can be confirmed if (a) and any one of (b) and (c) are met and other diseases related to the disease are excluded.

Chinese medicine identification criteria: referring to the "Chinese Medicine Gynecology" [19] and the "Chinese Medicine Diagnostic Efficacy Criteria" [20] published by the State Administration of Traditional Chinese Medicine to develop the diagnostic criteria for kidney yang deficiency. Primary symptoms: menstrual cycle disorders or amenorrhea, cold limbs and cold feet, lower libido, lumbar and knee pain and weakness. Secondary symptoms: excessive amount of discharge, tinnitus and dizziness, pale face, clear and long urine, frequent nocturnal enuresis, light and fat tongue, white moss, and a sunken and weak pulse. Diagnostic

requirements: the primary symptom has two of them at the same time, and the secondary symptom has two of them, and the tongue and pulse coincide, then the diagnosis can be confirmed.

Inclusion and exclusion criteria

The inclusion criteria were listed as follows: (a) meeting the above western medical diagnostic criteria of PCOS and Chinese medicine identification criteria; (b) aged 18-50 years old; (c) normal comprehension ability and fluent verbal communication; (d) voluntarily participating in this study and signing the informed consent form; and (e) no history of western medicine treatment for PCOS.

The exclusion criteria were as follows: (a) patients with comorbid psychiatric diseases or serious cognitive deficiencies; (b) patients with comorbid serious medical and surgical diseases, hematologic diseases, cardiovascular and cerebrovascular diseases, immunodeficiencies, etc. who were not suitable to participate in the study; (c) patients who might have other causative factors, such as premature ovarian failure, adrenocortical hyperplasia, Cushing's syndrome, etc.; (d) patients who were taking part in other therapeutic research studies; and (e) pregnant women.

Interventions

Control group

In the control group, in addition to the routine care in the Chinese medicine department, traditional Chinese medicine prescriptions were taken orally for treatment. Based on the theories of "liver and kidney homology" and "liver storing blood " [17], the traditional Chinese medicine prescription adopts Shugan Yanggan Fuyang Tang. The specific drug composition includes: Radix Pseudostellariae, Poria, Atractylodes, Radix Paeoniae Rubra, Radix Paeoniae

Alba, Radix Astragali seu Hedysari, Radix Angelicae Sinensis, Rhizoma Cyperi, Fructus Amomi, Radix Curcumae, Radix Puerariae, Herba Artemisiae Scopariae, Rhizoma Imperatae, Pyrrosia, Herba Lysimachiae, and Radix Glycyrrhizae. Patients start to take Chinese herbal medicine orally on the third day of menstruation every month, decocting with water, taking 200 ml each in two doses in the morning and evening, one dose/day, 28 days as a course of treatment, and taking 3 consecutive courses of treatment.

Intervention group

The intervention group was treated with Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine [21]. The traditional Chinese medicine, the method of administration and the course of treatment were the same as that of the control group. On its basis, the combination of Xiaozhoutian fire dragon moxibustion was treated for three courses (starting from the third day of the end of menstruation, three times a month for 1 course of treatment, excluding menstruation) for a total of three months. The operation method of Xiaozhoutian fire dragon moxibustion is as follows. Do the moxibustion of the Du vessel first, and then the Ren vessel. After the patient exposes the moxibustion site, lay a warm yang medicinal wine gauze block, lay two layers of large towels on top of it, and then lay a layer of warm wet small towels. Mugwort was laid flat on the towels, 95% alcohol was sprinkled on top of the moxa, and the fire was lit and burned. When the patient complains of tolerable warm spots, use a small wet towel (two overlapping) to cover the moxibustion site to extinguish the fire, and press the moxa part with both hands using the vertical method, the tremor method, the patting method, and other nudging techniques. Until the heat subsides, spray alcohol again to repeat the above operation. Flip the moxa after three times. Apply moxibustion a total of 3–5 times until the skin is evenly red, and blistering is not necessary. Each treatment time 30~40 minutes, the treatment process at any time to ask the patient's feelings and adjust the heat to

avoid burns.

Measurements

TCM symptom score

Referring to the scoring criteria developed by the State Administration of Traditional Chinese Medicine's "TCM Diagnosis and Treatment Programs for 104 Diseases in 24 Specialties (Trial)" [22], the patients' main symptoms were recorded one by one before and after treatment. These included (a) cold hands and feet, (b) fear of cold in the stomach and epigastric region, back, or waist and knees, (c) fear of cold and wearing more clothes than others, (d) intolerance of cold (cold in winter, air-conditioning fan in summer, etc.) than others, (e) catching a cold more easily than others, and (f) feeling uncomfortable or fear of eating (and drinking) cold things. All symptoms were scored on a 5-point Likert scale from 1 to 5, with 1 being the absence of the symptom and 5 being the presence of the symptom all the time. The total TCM Symptom Score was summed up from all the symptom scores, and the total score ranged from 5 to 30. The higher the score, the more severe the symptoms are.

Menstrual situation

Changes in the duration of the menstrual period and menstrual flow, as well as the scoring of symptoms accompanying menstruation, such as dysmenorrhea and the number of blood clots, were recorded before and after the treatment of the patients, and scored with reference to the scoring criteria of TCM drawn up by the "Guidelines for the Clinical Research of New Traditional Chinese Medicines (Trial Implementation)" [23]. (i) Duration of menstrual period: 4-7 days as 0 points, 1-3 days as 1 point, 8-15 days as 2 points. (ii) menstrual flow: 50~80 mL is normal, 0 points; less than normal is 1 point; more than normal is 2 points. (iii) Degree of dysmenorrhea: a visual analogue scale (VAS) [24] was used, using a 10 cm long ruler marked

with a scale of 0 to 10 points, with 0 points representing no pain felt and 10 points representing the strongest pain. The score of pain intensity was derived directly from the values marked by the patient on the scale. (iiii) Clot status: no clot was rated as 0, a small number of clots was rated as 1, and many clots was rated as 2.

Serum sex hormone level

Early morning fasting venous blood was drawn from patients before and after treatment, and serum was cryo-separated using the SteroIDQ kit (BIOCRATES Life Sciences AG, Innsbruck, Austria) to measure serum luteinizing hormone (LH), follicle-stimulating hormone (FSH), luteinizing hormone/follicle-stimulating hormone ratio (LH/FSH), estradiol (E2), testosterone (T), and progesterone (P) levels [25].

Efficacy criteria

Evaluate the efficacy of patients after treatment with reference to the PCOS-related standards in Gynecological Endocrinology [26]. (a) Cured: menstrual cycle returns to normal, symptoms accompanying menstruation disappears, menstrual volume, color and quality basically return to normal, and sex hormone level returns to normal. (b) Obvious effect: the menstrual cycle is basically back to normal (the interval between two menstrual periods is within 30-35 days), the symptoms accompanying menstruation have been significantly relieved, menstrual flow, color and quality have been greatly improved compared with the pre-treatment period, and the sex hormone levels have been improved to a certain extent compared with the previous period. (c) Effective: the menstrual cycle returns to normal to a certain extent (the interval between two menstrual periods is within 34-40 days), the accompanying symptoms of menstruation are mildly relieved, the menstrual volume, color and quality are slightly improved, and the sex hormone level is slightly improved compared with the previous one. (d) Ineffective: no significant improvement in menstrual cycle with treatment, no improvement in symptoms

accompanying menstruation, no significant change in menstrual volume, color and quality, and no improvement in sex hormone level. Total effective rate = (cured + obvious effect + effective) number of cases / total number × 100%.

Statistical analysis

IBM SPSS Statistics (Version 26.0, IBM Corp, Armonk, New York State, USA) software was used for statistical analysis. Measurement information was compared between groups using t-test and expressed as mean ± standard deviation. Comparison of count data between groups was performed using the chi-square test and expressed as frequency and percentage. $p < 0.05$ indicated that the difference was statistically significant.

Technical route

The study of technical route consult Figure 1.

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the First Affiliated Hospital of Nanchang University [(2024)CDYFYYLK(12-241)]. Written informed consent was obtained from all participants.

RESULTS

Patients' characteristics

A total of 80 PCOS patients with kidney-yang deficiency were included in this study, and they were divided into the control group and the intervention group according to the principle of randomized control, and 40 subjects were included in each of the two groups. Both groups of

participants completed the study, and no one withdrew (Figure 2).

Demographic and disease information

The minimum age of the participants in the control group was 19 years and the maximum age was 44 years with a mean age of (32.63 ± 5.53) years. The age range of the participants in the intervention group was 19–43 years old, with a mean age of (31.48 ± 5.22) years. There was no statistically significant difference in the age of the patients in the two groups ($p > 0.05$) and they were comparable. The mean duration of the disease in the control group was (3.37 ± 1.68) years, of which 1(3%) had a duration of less than 12 months, 4(10%) from 12 to 24 months, 7(17%) from 25 to 48 months and 28(70%) from more than 48 months. The mean duration of the disease in the intervention group was (3.43 ± 1.96) years, of which three (7%) had a duration of less than 12 months, 0 (0%) had a duration of 12–24 months, 13 (33%) had a duration of 25–48 months, and 24 (60%) had a duration of more than 48 months. There was no statistically significant difference in the duration of PCOS between the two groups ($p > 0.05$), and they were comparable. See Table 1 for details.

Ultrasound monitoring status before treatment

Table 2 shows that there was no statistically significant difference ($p > 0.05$) in ovarian volume, number of follicles, and endometrial thickness between the two groups of participants compared to the pre-treatment period, and the baseline balance was comparable.

Comparison of pain scores before treatment

Table 3 shows that there was no statistically significant difference ($P > 0.05$) in the pre-treatment pain scores of the two groups of participants, and they were comparable.

Comparison of TCM symptom scores before and after treatment between the two groups

of patients

Comparison of the TCM symptom scores of the two groups of patients before treatment, the difference was not statistically significant ($p > 0.05$). After treatment, the TCM evidence scores of patients in both groups improved, and the improvement in the intervention group was more obvious than that in the control group, and the difference was statistically significant ($P < 0.05$). See Table 4 for details.

Comparison of menstrual situation before and after treatment in the two groups

Before treatment, there was no statistically significant difference in the comparison of menstrual conditions between the two groups ($p > 0.05$). After treatment, the duration of menstrual period, menstrual flow, degree of dysmenorrhea, and blood clots in both groups decreased compared with the pre-treatment period, and the decrease in the intervention group was more obvious than that in the control group, and the difference was statistically significant ($P<0.05$). See Table 5 for details.

Comparison of serum sex hormone levels before and after treatment between the two groups of patients

As can be seen from Table 6, before treatment, there was no statistical difference between the serum sex hormone levels of the two groups of patients ($p > 0.05$). After treatment, the serum sex hormone levels of both groups of patients showed significant improvements compared with the pre-treatment period, with more pronounced improvements in the intervention group. Specifically, the levels of luteinizing hormone (LH) decreased from 22.76 ± 15.32 mIU/ml to 17.62 ± 13.50 mIU/ml in the control group and from 21.54 ± 14.65 mIU/ml to 11.55 ± 8.30 mIU/ml in the intervention group, with the intervention group exhibiting a greater reduction. The follicle-stimulating hormone (FSH) levels also decreased, from 6.04 ± 2.51 mIU/ml to

5.41 ± 2.25 mIU/ml in the control group and from 5.97 ± 2.49 mIU/ml to 4.48 ± 1.79 mIU/ml in the intervention group. The LH/FSH ratio, which is an important indicator of PCOS, decreased from 3.58 ± 0.97 to 3.07 ± 1.12 in the control group and from 3.46 ± 0.88 to 2.47 ± 0.55 in the intervention group, indicating a more significant improvement in the intervention group. Additionally, the estradiol (E2) levels increased from 50.50 ± 12.09 pg/ml to 43.43 ± 10.52 pg/ml in the control group and from 52.25 ± 10.80 pg/ml to 37.85 ± 6.24 pg/ml in the intervention group, while the testosterone (T) levels decreased from 82.40 ± 15.12 ng/dL to 67.75 ± 15.00 ng/dL in the control group and from 81.89 ± 14.45 ng/dL to 49.25 ± 11.55 ng/dL in the intervention group, with the intervention group showing a more substantial decrease. Finally, the progesterone (P) levels increased from 1.38 ± 0.97 ng/dL to 1.65 ± 1.01 ng/dL in the control group and from 1.26 ± 0.91 ng/dL to 2.17 ± 1.10 ng/dL in the intervention group. All these changes in serum sex hormone levels were statistically significant (P<0.05), with the intervention group demonstrating more pronounced improvements compared to the control group.

Comparison of the efficacy of the two groups of patients

As shown in Table 7, after treatment, the total effective rate of treatment of patients in the intervention group reached 92.5%, which was higher than that of 72.50% in the control group ($p < 0.05$).

DISCUSSION

The aim of this study was to investigate the clinical efficacy of Xiaozhoutian fire dragon moxibustion combined with traditional Chinese medicine in the treatment of PCOS with kidney yang deficiency. The results of the study showed that the intervention group demonstrated significant improvements in TCM symptom scores, menstrual conditions, and serum sex hormone levels. Specifically, the TCM symptom scores of patients in the intervention group

improved significantly compared with those of the control group after treatment, and the menstrual situation, including the duration of the menstrual period, the amount of menstrual flow, the degree of dysmenorrhea, and blood clots, also improved significantly, while the serum sex hormone levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH), luteinizing hormone/follicle-stimulating hormone ratio (LH/FSH), estradiol (E2), testosterone (T), and progesterone (P) were improved, and the total effective rate of the intervention group was also significantly increased.

The results of this study echo previous studies that have shown that TCM treatment has potential effects in regulating endocrine and improving PCOS symptoms. For instance, a study by Li et al [27] found that acupuncture combined with moxibustion, as an adjunct to the basic treatment, could improve pregnancy, ovulation, and miscarriage rates, as well as certain sex hormone levels and metabolic indicators in patients with PCOS, with good safety. Kwon et al.'s meta-analysis explored the efficacy and safety of Oriental Herbal Medicine (OHM) combined with moxibustion in the treatment of PCOS. The study found that compared with the use of Western medicine (WM) alone, OHM combined with moxibustion significantly increased pregnancy rates, normal biphasic basal body temperature rates, and total effective rate (TER) in patients with PCOS [28]. When OHM combined with moxibustion was used as an adjunct to WM, it also showed significant improvements in pregnancy rates and TER. Deng et al [29] studied the efficacy of combined traditional Chinese medicine therapies in the treatment of infertility associated with PCOS. The study found that compared with traditional single therapies, the combined Chinese medicine therapy showed better efficacy in treating PCOS-related infertility, with moxibustion combined with Chinese herbs, fire needle combined with Chinese herbs, and acupuncture combined with Chinese herbs being the three most effective therapies in improving clinical pregnancy rates. Jazani [30] et al. reviewed the herbs used globally for the treatment of PCOS. It was found that herbs such as cinnamon, fenugreek,

and chaste tree may be beneficial in ameliorating different aspects of PCOS by significantly reducing serum FBS, insulin and insulin resistance levels, as well as cholesterol, triglyceride, and low-density lipoprotein (LDL) levels. This is corroborated with the composition of the formula used in this study.

The results of this study not only confirm the potential of traditional Chinese medicine in treating PCOS but also reveal the possible mechanism of action of this comprehensive treatment method. Firstly, based on the TCM theory that "the kidney is the master of reproduction," we selected the herbal formula Shu Gan Wen Yang Tang, which aims to warm the kidney yang, disperse cold, nourish the liver, and warm the kidneys. These effects are consistent with the observed improvements in menstrual conditions, reduced serum sex hormone levels, and increased ovulation rates. We found that the intervention group showed a significant improvement in TCM symptom scores after treatment, which may be related to the warming and cold-dispersing effects of the herbal formula, helping to adjust and improve the overall endocrine status of the patients. Secondly, the application of Xiaozhoutian fire dragon moxibustion, through its warming effect and the efficacy of herbs and alcohol, impacts the Du and Ren meridians, which aligns with the TCM concept of regulating yin and yang as well as qi and blood. The warm stimulation of the fire dragon moxibustion may promote local blood and lymphatic circulation, enhance the metabolic capacity of the local skin, which is consistent with our observed improvements in menstrual conditions and changes in serum sex hormone levels. Furthermore, the local stimulation effect of the fire dragon moxibustion may diffuse inhibitory substances in the cerebral cortex, reduce the excitability of the nervous system, and exert sedative and analgesic effects. This may explain why the intervention group showed more significant improvements in the degree of dysmenorrhea and the number of blood clots. Lastly, our study also emphasizes the importance of complementary internal and external medications. The combination of Xiaozhoutian fire dragon moxibustion and tonic therapy may improve drug

absorption and efficacy, which is consistent with our observation that the total effective rate of treatment in the intervention group was significantly higher than that in the control group.

However, it should be noted that this study still has some shortcomings, including small sample size, simple study design, and lack of international diagnostic standards. Therefore, when further similar studies are conducted in the future, it is necessary to standardize the study design, increase the sample size, fully consider potential interfering factors, and optimize the treatment protocols to further validate the reliability of the results of this study and the prospect of clinical application. Meanwhile, future studies should also incorporate broader expert knowledge and introduce a more rigorous randomized controlled design to improve the credibility and scientific validity of the study.

CONCLUSION

In conclusion, TCM combination therapy has shown certain advantages in the treatment of PCOS, but more high-quality and multilevel studies are still needed to verify its clinical efficacy and mechanism to further promote the application and development of TCM in the treatment of reproductive endocrine diseases.

ACKNOWLEDGEMENTS

Funding: Science and technology plan of Jiangxi Provincial Administration of Traditional Chinese Medicine (2023B0386) and Key R&D Project of Jiangxi Provincial Department of Science and Technology (No.20203BBE52W010).

Authors' contributions: Yu LX conceived of the study, and Li XY, Wu CH, Wang LQ and

Gao Y participated in its design and data analysis and statistics and Long MX, Gan Q and Xiong MF helped to draft the manuscript. All authors read and approved of the final manuscript.

Conflict of interest: None declared.

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Table 1. Baseline profile of participants (age, disease duration) in both groups

Groups	n	Mean age (years old)	Mean duration of polycystic ovarian syndrome (years)
Control group	40	32.63 ± 5.53	3.37 ± 1.68
Intervention group	40	31.48 ± 5.22	3.43 ± 1.96
t-value		-0.127	-0.113
p-value		0.803	0.795

* $p < 0.05$

Table 2. Comparison of pre-treatment ultrasound monitoring between the two groups of participants

Groups	*n*	Ovarian volume (M^3)	Number of follicles	Endometrial thickness (mm)
Control group	40	12.68 ± 1.73	13.12 ± 1.82	16.75 ± 2.31
Intervention group	40	12.67 ± 1.70	13.14 ± 1.81	16.61 ± 2.34
t-value		5.010	2.768	2.332
p-value		0.853	0.876	0.890

* $p < 0.05$

Table 3. Comparison of pre-treatment pain scores between the two groups of participants

Groups	n	Pain scores
Control group	40	1.96 ± 0.45
Intervention group	40	1.93 ± 0.44
t-value		5.210
P-value		0.764

* $p < 0.05$

Table 4. Comparison of traditional Chinese medicine symptom scores before and after treatment between the two groups

Groups	n	Pre-treatment	Post-treatment
Control group	40	25.45 ± 2.83	21.78 ± 2.71
Intervention group	40	25.53 ± 3.03	18.58 ± 4.05
t-value		-0.114	4.152
p-value		0.909	< 0.001*

* $p < 0.05$

Table 5. Comparison of menstrual situation before and after treatment in the two groups

Menstrual situation	Time	Control group (n = 40)	Intervention group (n = 40)	t-value	p-value
Duration of menstrual period	Pre-treatment	1.15 ± 0.74	1.25 ± 0.74	-0.605	0.547
	Post-treatment	0.45 ± 0.71	0.13 ± 0.40	2.504	0.015*
Menstrual flow	Pre-treatment	1.35 ± 0.62	1.33 ± 0.66	0.175	0.862
	Post-treatment	0.68 ± 0.80	0.28 ± 0.55	2.606	0.011*
Degree of dysmenorrhea	Pre-treatment	3.73 ± 2.45	4.00 ± 2.36	-0.511	0.611
	Post-treatment	1.70 ± 1.27	0.98 ± 1.12	2.713	0.008*
Blood clots	Pre-treatment	1.55 ± 0.50	1.65 ± 0.48	-0.906	0.368
	Post-treatment	1.00 ± 0.64	0.43 ± 0.55	4.309	<0.001*

* $p < 0.05$

Table 6. Comparison of serum sex hormone levels before and after treatment between the two groups of patients

Serum sex hormone	Time	Control group (n = 40)	Intervention group (n = 40)	t-value	p-value
LH（mIU/ml）	Pre-treatment	22.76 ± 15.32	21.54 ± 14.65	0.363	0.717
	Post-treatment	17.62 ± 13.50	11.55 ± 8.30	2.422	0.018*
FSH（mIU/ml）	Pre-treatment	6.04 ± 2.51	5.97 ± 2.49	0.12	0.905
	Post-treatment	5.41 ± 2.25	4.48 ± 1.79	2.055	0.043*
LH/FSH	Pre-treatment	3.58 ± 0.97	3.46 ± 0.88	0.574	0.568
	Post-treatment	3.07 ± 1.12	2.47 ± 0.55	3.038	0.004*
E_2（pg/ml）	Pre-treatment	50.50 ± 12.09	52.25 ± 10.80	-0.683	0.497
	Post-treatment	43.43 ± 10.52	37.85 ± 6.24	2.884	0.005*
T（ng/dL）	Pre-treatment	82.40 ± 15.12	81.89 ± 14.45	0.154	0.878
	Post-treatment	67.75 ± 15.00	49.25 ± 11.55	6.181	<0.001*
P（ng/dL）	Pre-treatment	1.38 ± 0.97	1.26 ± 0.91	0.584	0.561
	Post-treatment	1.65 ± 1.01	2.17 ± 1.10	-2.234	0.028*

LH – luteinizing hormone; FSH – follicle-stimulating hormone; E_2 – estradiol; T – testosterone; P – progesterone

* $p < 0.05$

Table 7. Comparison of efficacy between the two groups (cases, %)

Groups	*n*	Cured	Obvious effect	Effective	Ineffective	Total effective rate
Control group	40	2	18	9	11	29（72.50）
Intervention group	40	6	26	5	3	37（92.50）
χ^2-value						8.966
p-value						0.032*

* $p < 0.05$

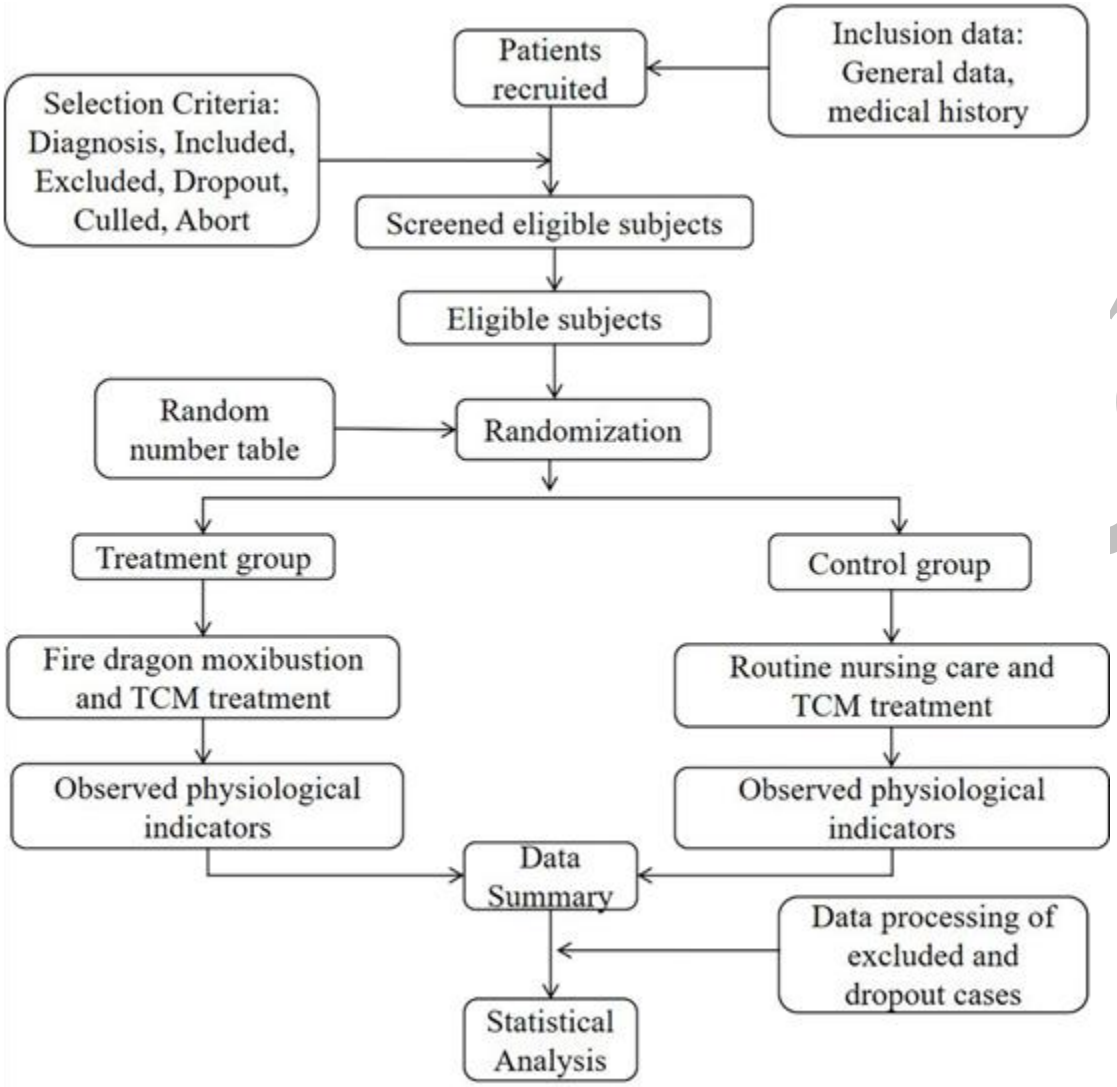

Figure 1 Technical route

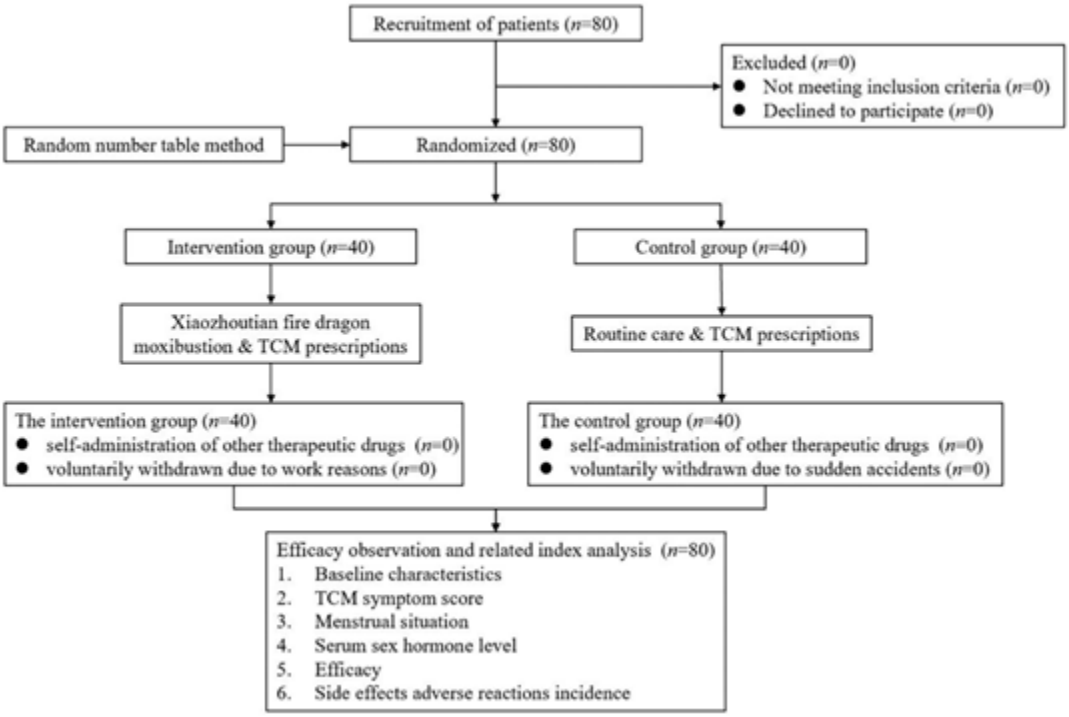

Figure 2. Flow of participants through the trial; TCM – traditional Chinese medicine

