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Full Paper

Acupoint catgut embedding combined with kidney-tonifying therapy improves insulin resistance in polycystic ovary syndrome: A retrospective case-control study

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Abstract: This study evaluates the effectiveness of acupoint catgut embedding combined with kidney-tonifying, phlegm-resolving and blood stasis-removing therapy in the treatment of polycystic ovary syndrome (PCOS) and improvement of insulin resistance. A retrospective case-control study was conducted on 154 patients diagnosed with PCOS between January 2021 and January 2023, identified through hospital electronic medical records. Based on treatment methods, 81 patients were assigned to the observation group (acupoint catgut embedding combined with tonifying kidney, resolving phlegm and removing blood stasis) and 73 patients to the comparison group (treated with ethinylestradiol-cyproterone tablets and metformin). Serum luteinising hormone (LH), follicle-stimulating hormone (FSH), estradiol (E2), testosterone (T), fasting insulin (FINS) and fasting plasma glucose levels were measured before and after treatment. Additional parameters assessed included body mass index, LH/FSH ratio, homeostasis model assessment of insulin resistance (HOMA-IR) and clinical symptoms. After treatment, significant reductions in T, E2, LH and LH/FSH ratio were observed in both groups, with more pronounced improvements in the observation group ($P < 0.05$). FSH level did not differ significantly between groups. Notably, FINS, HOMA-IR and B-ultrasound scores decreased to a greater extent in the observation group.

Keywords: acupoint catgut embedding, kidney-tonifying, polycystic ovary syndrome, insulin resistance, phlegm-resolving, stasis-removing therapy

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common gynaecological endocrine disorder with high prevalence among women of reproductive age [1]. According to statistics, its global incidence is approximately 5-10% and due to changes in modern lifestyle such as high-calorie diet and reduced physical activity, its prevalence is steadily increasing [2]. PCOS is characterised by dysfunction of the hypothalamic-pituitary-ovarian axis, with insulin resistance (IR) being a key pathological feature. IR reduces cellular insulin sensitivity and leads to compensatory hyperinsulinaemia [3].

IR plays a key role in the pathogenesis of PCOS. Insulin, an essential hormone that regulates glucose metabolism, functions abnormally in PCOS due to disruptions in insulin signal transduction pathways, which impair its physiological effects [4]. As a result, blood glucose level rises, increasing the risk of developing type-2 diabetes. Additionally, insulin stimulates the ovarian theca cells to secrete excessive androgens, worsening hyperandrogenaemia in PCOS patients [5]. Current treatment options primarily include oral contraceptives to regulate the menstrual cycle and metformin to improve insulin sensitivity [6]. Oral contraceptives help balance sex hormone levels by suppressing LH secretion, but long-term use may have some side effects such as an increased risk of thrombosis. Metformin, while effective in enhancing insulin sensitivity, may cause side effects such as gastrointestinal discomfort and some patients may exhibit poor compliance [7].

Several previous studies have explored the therapeutic potential of acupuncture and acupoint catgut embedding therapy in patients with PCOS. Systematic reviews and meta-analyses have suggested that acupoint catgut embedding may improve endocrine metabolism, obesity-related indicators and reproductive outcomes in women with PCOS [8, 9]. Clinical studies have also reported that acupoint embedding combined with traditional Chinese medicine or conventional pharmacotherapy may improve ovulation rate, hormone levels and IR in PCOS patients [10]. In addition, increasing evidence indicates that acupuncture-related therapies may regulate neuroendocrine function, inflammatory responses and insulin signalling pathways involved in the pathogenesis of PCOS [11].

However, several important limitations remain in the existing literature. First, many previous studies mainly focused on obesity-related parameters or reproductive outcomes while comprehensive evaluations of endocrine function, IR, ovarian morphology, menstrual recovery, ovulation rate and quality-of-life indicators within the same clinical cohort remain limited. Second, most studies investigated acupuncture or acupoint embedding alone, whereas relatively few studies evaluated the combined strategy of acupoint catgut embedding together with kidney-tonifying, phlegm-resolving and blood stasis-removing therapy based on traditional Chinese medicine theory. Third, the specific clinical efficacy of this integrative intervention on IR-associated parameters in patients with PCOS remains insufficiently clarified.

Therefore, the present retrospective case-control study aimed to investigate whether acupoint catgut embedding combined with kidney-tonifying, phlegm-resolving and blood stasis-removing therapy could improve endocrine abnormalities, IR, ovarian morphology, menstrual recovery, ovulation outcomes and quality of life in patients with PCOS compared with conventional

pharmacotherapy.

Acupoint catgut embedding involves the insertion of absorbable sutures into acupoints, providing continuous stimulation that unblocks meridians and harmonises Qi (a traditional Chinese medicine concept referring to vital energy) and blood flow [12]. From a modern medical perspective, catgut embedding may influence physiological functions by modulating the neuroendocrine-immune network. In the context of PCOS, it may act on the hypothalamic-pituitary-ovarian axis to regulate hormone secretion. Furthermore, it may enhance neuroendocrine signalling pathways associated with IR. The traditional herbal approach of tonifying the kidney, resolving phlegm and removing blood stasis serves to eliminate pathological factors such as phlegm and blood stasis from the body [13]. Kidney-tonifying herbs are believed to regulate the kidney-Tiangui-Chongren-uterus axis, thereby improving ovarian function. These herbs also help to optimise the internal physiological environment, restoring normal menstrual cycles and ovulation. Given the high incidence of PCOS, complex pathophysiological mechanisms and limitations of existing treatments, it is of great clinical significance to explore the effect of acupoint catgut embedding combined with kidney-tonifying, phlegm-resolving and stasis-removing therapy on the effectiveness of PCOS and IR.

MATERIALS AND METHODS

This study was approved by the ethics committee of Guizhou University of Traditional Chinese Medicine, Huaxi District, Guiyang, Guizhou 550025, China (Approval no. 2021-0131KY). Signed written informed consents were obtained from the patients and/or guardians. This study was conducted in accordance with the Declaration of Helsinki.

To ensure reproducibility across centres, all interventions adhered to strict standardised protocols. In addition, adverse event management in all experimental groups followed predefined protocols for the management of common treatment-related reactions.

Study Population

This retrospective case-control study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines [14]. A total of 154 patients diagnosed with PCOS between January 2021 and January 2023 were identified through hospital electronic medical records. According to the historical treatment strategies documented in the records, 81 patients received acupoint catgut embedding combined with herbal therapy (observation group) while 73 patients received conventional pharmacotherapy (comparison group). Sample size estimation was performed using G*Power 3.1.9.7 software based on changes in the homeostasis model assessment of IR (HOMA-IR). PCOS diagnosis was established according to the criteria of the European Society of Human Reproduction and Embryology and the American Society for Reproductive Medicine [15].

PCOS Inclusion and Exclusion Criteria

The inclusion criteria for PCOS patients required the availability of complete clinical data, confirmation that the patient met the diagnostic criteria for PCOS and an age range between 18 and

36 years.

Patients were excluded from the study if they had any other endocrine disorders such as hyperprolactinemia, thyroid disease, Cushing's syndrome or diabetes. Additional exclusion criteria included the use of hormone medications within the past three months, abnormal liver or kidney function, congenital physiological defects or malformations, mental health disorders, or any confirmed organic reproductive conditions such as endometriosis, uterine fibroids or uterine dysplasia as determined through gynaecological examination or B-ultrasonography. Patients who had undergone recent surgery or experienced trauma were also excluded, as well as those with non-compliant or incomplete medication usage or insufficient clinical documentation.

Acupoint Catgut Embedding, Tonifying Kidney, Resolving Phlegm and Removing Blood Stasis

Patients began acupoint catgut embedding and took the prescription for tonifying the kidney, removing phlegm and removing stasis on the fifth day of menstruation or after progesterone withdrawal bleeding. The prescription for tonifying the kidney, resolving phlegm and removing blood stasis consisted of *Dodder seed* 15 g, *Epimedium* 15 g, *Cistanche deserticola* 15 g, *Rehmannia glutinosa* 15 g, *Angelica sinensis* 12 g, *Ligusticum chuanxiong* 6 g, *Eclipta prostrata* 15 g, *Poria cocos* 15 g, *Pinellia ternata* 10 g, *vinegar-prepared turtle shell* 12 g, *Gleditsia sinensis* 15 g and *Glycyrrhiza uralensis* 6 g. One dose was taken per day with 300 mL of decoction extracted with water, administered twice daily—once in the morning and once in the evening. The medication was suspended during menstruation. The course of treatment lasted six months. All herbal decoctions were prepared according to standardised procedures under quality-controlled conditions.

Acupoint catgut embedding therapy was initiated on the fifth day of the menstrual cycle or after progesterone-induced withdrawal bleeding. Sterile disposable embedding needles and 3-0 medical catgut were used for all procedures. Selected acupoints were CV12, ST25, CV6, CV4, CV9, SP9, ST40, GB26, ST37 and ST36. Following routine disinfection, catgut embedding was performed according to standardised procedures until the “deqi” sensation (a characteristic sensation of soreness, numbness, heaviness or distension indicating effective acupoint stimulation) was achieved. Treatments were administered once every 15 days for 3 months, with suspension during menstruation.

All procedures were performed by experienced attending physicians from the Department of Acupuncture and Moxibustion of the First Affiliated Hospital of Guizhou University of Traditional Chinese Medicine. Standardised training and operating protocols were applied to ensure procedural consistency throughout the study. Acupoints were identified according to the WHO Standard Acupuncture Point Locations and photographs of landmarking procedures were included in operator training manuals for physicians performing acupoint catgut embedding. A representation of the embedding procedure is shown in Figure 1. For the observation group, herbal medicines used in the kidney-tonifying, phlegm-resolving and blood stasis-removing therapy were sourced from GMP-certified suppliers and authenticated through macroscopic and microscopic examination. Decoctions were centrally prepared by trained pharmacists using automated machines, and

temperature and time logs were archived throughout the preparation process.

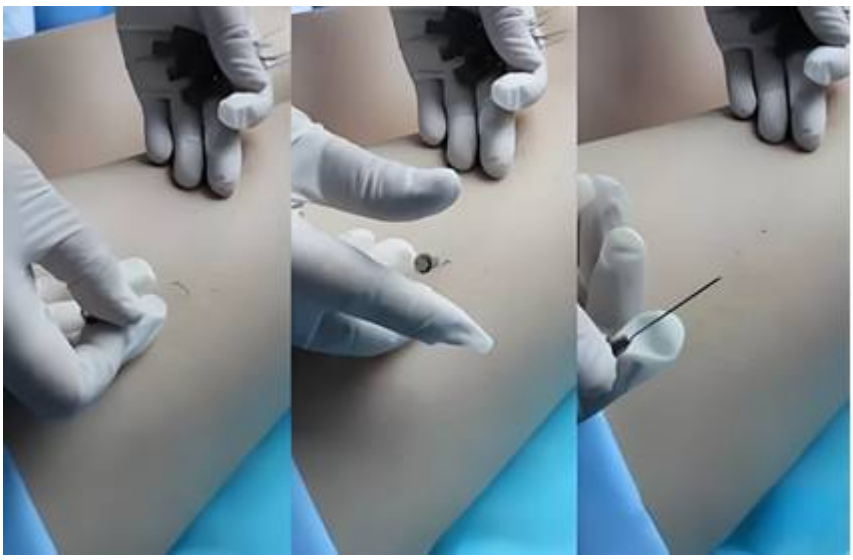

Figure 1. Acupoint catgut embedding therapy. The three panels show sequential steps of the procedure: acupoint localisation, needle insertion and catgut embedding, and needle withdrawal after implantation.

Comparison Group

Patients in the comparison group began treatment with ethinylestradiol-cyproterone tablets, manufactured by Schering GmbH & Co. Produktions KG in Germany, starting on the fifth day of their menstrual cycle or on the fifth day following withdrawal bleeding. One tablet (containing 2 mg cyproterone acetate and 0.035 mg ethinylestradiol) was taken daily for 21 consecutive days followed by a 7-day break, after which the next cycle was initiated. This regimen was continued for three consecutive treatment cycles. At the same time, patients were also instructed to take metformin hydrochloride, produced by Tianjin Zhongxin Pharmaceutical Co., China, at a dosage of 0.5 g twice daily for a duration of six months.

Observation Indicators and Evaluation Criteria

Life indicators

Before and after treatment, fasting venous blood samples were collected from the patients between 9:00–10:00 a.m. on the third day of menstruation. Serum follicle-stimulating hormone (FSH), luteinising hormone (LH), estradiol (E2), testosterone (T) and fasting insulin (FINS) levels were determined using standard chemiluminescence immunoassays, while fasting plasma glucose (FPG) levels were measured using the glucose oxidase method. Ovarian volume and follicle count were evaluated by ultrasound both before and after treatment, performed on the fifth day of menstruation or during amenorrhoea.

B-ultrasound score

A score of 0 indicates normal morphology in both ovaries. A score of 1 is assigned when

there is a unilateral ovarian volume of ≥10 mL and/or a single ovary contains ≥12 visible follicles measuring 2–9 mm in diameter. A score of 2 reflects bilateral ovarian enlargement (≥10 mL) and/or the presence of ≥12 visible follicles (2–9 mm in diameter) in both ovaries.

Serum hormone detection in patients with amenorrhoea

Amenorrhoeic patients were defined according to the diagnostic criteria of the European Society of Human Reproduction and Embryology and the American Society for Reproductive Medicine [15]. To standardise hormone assessment, progesterone-induced withdrawal bleeding was performed before serum hormone testing. Patients received oral progesterone capsules (200 mg/day) for 10 consecutive days and serum hormone samples were collected on the third day of withdrawal bleeding. For patients without withdrawal bleeding, organic lesions were excluded by gynaecological B-ultrasound and hormone testing was subsequently performed using the same standardised protocol.

Hirsutism score

The Ferriman-Gallwey scoring scale was used [16]. A score ≥ 5 defines hirsutism, with higher scores indicating greater severity

Acne score

Acne severity was assessed according to Global Acne Grading System based on the type and number of skin lesions, with higher scores indicating greater severity [17]. Patient-reported outcomes related to symptom improvement were also recorded. Menstrual recovery was defined as spontaneous menstrual cycles occurring at intervals of 21–35 days for at least three consecutive months after treatment. Ovulation was evaluated by transvaginal or abdominal B-ultrasound during the peri-ovulatory phase and the ovulation rate was calculated as the proportion of monitored cycles showing evidence of ovulation. Quality of life was assessed at baseline and after 6 months of treatment using the Polycystic Ovary Syndrome Health-Related Quality of Life Questionnaire (PCOSQ) [18], which evaluates emotional status, body hair, weight, infertility concerns and menstrual problems.

Statistical Methods

Statistical analysis was performed using IBM SPSS 26.0. Normality of all continuous variables (including LH, FSH, E2, T, FINS, FPG, HOMA-IR, BMI and B-ultrasound score) was confirmed by Shapiro-Wilk test (all $P > 0.05$). Paired t-tests were used for within-group comparisons (pre- vs post-treatment), while independent t-tests were used for between-group comparisons of continuous variables. Categorical data were analysed by Chi-square test or Fisher's exact test as appropriate. Results were considered significant at two-tailed $P < 0.05$.

RESULTS AND DISCUSSION

Building on the established role of IR in PCOS pathogenesis [19], this retrospective analysis of 154 patients demonstrates that acupoint catgut embedding combined with kidney-tonifying

therapy significantly improves IR-related parameters, with greater efficacy than conventional pharmacotherapy.

Baseline comparisons reveal no statistically significant differences in age, disease duration, body mass index (BMI), waist circumference, hirsutism scores or acne scores between the groups ($P > 0.05$), confirming comparability (Data not shown).

Hormonal parameters such as T, E2, LH, FSH and LH/FSH ratios show no significant differences between the groups before treatment (Table 1). Specifically, T levels in the observation group are 76.56 ± 18.97 ng/dL compared to 73.73 ± 19.32 ng/dL in the comparison group with no statistically significant difference ($P > 0.05$). After treatment, T levels decline in both groups, reaching 50.10 ± 15.67 ng/dL in the observation group and 46.56 ± 14.92 ng/dL in the comparison group. Although post-treatment T levels remain higher in the observation group, the magnitude of reduction is significantly greater compared to the comparison group ($P < 0.05$), indicating a more pronounced decline in T level as a result of the intervention.

Similarly, E2 levels before treatment are 51.15 ± 18.15 pg/mL in the observation group and 49.89 ± 16.95 pg/mL in the comparison group with no significant difference observed. After treatment, E2 levels decrease to 47.23 ± 12.32 pg/mL in the observation group and 44.52 ± 11.78 pg/mL in the comparison group. Although both groups show a decline, the reduction is significantly more pronounced in the observation group compared to the comparison group ($P < 0.05$).

LH levels are 13.07 ± 6.28 mIU/mL in the observation group and 13.49 ± 6.50 mIU/mL in the comparison group before treatment with no significant difference. After treatment LH levels decline to 7.85 ± 1.81 mIU/mL in the observation group and 6.27 ± 2.34 mIU/mL in the comparison group. Although LH levels remain slightly higher in the observation group after treatment, the degree of reduction is significantly greater than that observed in the comparison group ($P < 0.05$), indicating a stronger regulatory effect.

For FSH, pre-treatment levels are 6.46 ± 2.26 mIU/mL in the observation group and 6.11 ± 3.38 mIU/mL in the comparison group with no significant difference noted. Following treatment, FSH levels increase to 7.51 ± 1.67 mIU/mL in the observation group and decrease slightly to 6.20 ± 2.12 mIU/mL in the comparison group. However, the difference between the groups remains statistically insignificant.

The LH/FSH ratios, a key endocrine marker in PCOS, also show insignificant difference between groups at baseline (2.11 ± 0.60 in the observation group vs 2.26 ± 0.73 in the comparison group). After treatment, both groups demonstrate a reduction in the LH/FSH ratio, falling to 1.60 ± 0.17 in the observation group and 1.01 ± 0.23 in the comparison group. Although a decline is seen in both groups, the reduction is significantly greater in the observation group ($P < 0.05$), highlighting the enhanced efficacy of the combined intervention.

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Table 1. Comparison of endocrine hormone levels

	Observation group (n=81)		Comparison group (n=73)	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
T (ng/dL)	76.56±18.97*	50.10±15.67#	73.73±19.32	46.56±14.92
E2(pg/mL)	51.15±18.15*	47.23±12.32#	49.89±16.95	44.52±11.78
LH (mIU/mL)	13.07±6.28*	7.85±1.81#	13.49±6.50	6.27±2.34
FSH (mIU/mL)	6.46±2.26*	7.51±1.67#	6.11±3.38	6.20±2.12
LH/FSH	2.11±0.6*	1.60±0.17#	2.26±0.73	1.01±0.23

* Comparison between groups before treatment ($P > 0.05$); # Comparison between groups after treatment ($P < 0.05$)

To assess the impact of both interventions on metabolic outcomes in patients with PCOS, key indicators related to IR were measured and compared between the two groups before and after treatment. Prior to treatment, FINS levels are 16.28 ± 4.63 mU/L in the observation group and 16.92 ± 3.94 mU/L in the comparison group with no statistically significant difference between the two groups ($P > 0.05$) (Table 2). After treatment, FINS levels decline in both groups, reaching 11.78 ± 4.02 mU/L in the observation group and 10.50 ± 3.40 mU/L in the comparison group. Although FINS remains higher in the observation group at post-treatment, the degree of reduction is significantly greater compared to the comparison group ($P < 0.05$), indicating a notable improvement in insulin regulation.

Regarding FPG, the pre-treatment values are 5.66 ± 1.45 mmol/L in the observation group and 5.34 ± 1.73 mmol/L in the comparison group, showing no significant difference. After treatment, FPG increases slightly in the observation group to 5.88 ± 1.01 mmol/L while it decreases marginally in the comparison group to 5.32 ± 1.25 mmol/L. However, the difference between the two groups remains statistically insignificant.

The HOMA-IR also shows comparable baseline values of 4.10 ± 1.24 in the observation group and 4.01 ± 1.58 in the comparison group with no significant difference. After treatment, HOMA-IR decreases to 2.97 ± 0.27 in the observation group and 2.43 ± 0.46 in the comparison group. Despite both groups showing improvement, the observation group exhibits a significantly greater reduction than the comparison group ($P < 0.05$), suggesting enhanced insulin sensitivity with the combined therapy.

In terms of B-ultrasound scores, no significant difference was observed at baseline: 1.27 ± 0.44 in the observation group and 1.20 ± 0.39 in the comparison group. Post-treatment values decline to 0.72 ± 0.53 and 0.50 ± 0.58 respectively. Although both groups demonstrate improvement, the reduction is significantly more pronounced in the observation group ($P < 0.05$), indicating better restoration of ovarian morphology.

BMI is also comparable between groups before intervention—23.65 ± 2.60 in the

observation group and 23.04 ± 4.02 in the comparison group (P > 0.05). After treatment, BMI decreases in both groups, but the magnitude of reduction is greater in the observation group (from 23.65±2.60 to 22.84±2.77, ΔBMI = -0.81) compared to the comparison group (from 23.04±4.02 to 22.38±4.48, ΔBMI = -0.66) (P < 0.05), indicating a more pronounced improvement in BMI in the observation group.

Table 2. Comparison of IR-related indicators

	Observation group (n=81)		Comparison group (n=73)	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
FINS (mU/L)	16.28±4.63*	11.78±4.02#	16.92±3.94	10.50±3.40
FPG (mmol/L)	5.66±1.45*	5.88±1.01#	5.34±1.73	5.32±1.25
HOMA-IR	4.10±1.24*	2.97±0.27#	4.01±1.58	2.43±0.46
B-ultrasound score	1.27±0.44*	0.72±0.53#	1.20±0.39	0.50±0.58
BMI	23.65±2.60*	22.84±2.77#	23.04±4.02	22.38±4.48

* Comparison between groups before treatment (P > 0.05); # Comparison between groups after treatment (P < 0.05)

The rate of menstrual cycle recovery is significantly higher in the observation group (76.54%) compared to the comparison group (57.53%) (P < 0.05) (Table 3). Similarly, the ovulation rate is markedly improved in the observation group (68.29%) versus the comparison group (49.32%) (P < 0.05). Quality of life as measured by the PCOSQ total score shows significant improvement in both groups after treatment (P < 0.05 for within-group comparison). However, the magnitude of improvement is significantly greater in the observation group (increase of 32.15 ± 8.72 points) compared to the comparison group (increase of 22.84 ± 7.95 points) (P < 0.05). Improvements are particularly notable in the domains related to menstrual problems and emotions.

Table 3. Comparison of symptom improvement and quality of life

Parameter	Observation Group (n=81)	Comparison Group (n=73)	P-value
Menstrual Recovery Rate, n (%)			
Pre-treatment	0	0	-
Post-treatment	62 (76.54%)	42 (57.53%)	<0.05
Ovulation Rate, n (%)			
(Per monitored cycle)	56/82 (68.29%)	36/73 (49.32%)	<0.05
PCOSQ Total Score (Mean ± SD)			
Pre-treatment	45.32 ± 10.15	46.78 ± 9.87	>0.05
Post-treatment	77.47 ± 12.36	69.62 ± 11.58	<0.05
Change (Post-Pre)	+32.15 ± 8.72	+22.84 ± 7.95	<0.05

These findings further support the important role of IR in the pathogenesis of PCOS. Dysregulation of insulin signalling pathways contributes to impaired follicular development, hyperandrogenism and endocrine dysfunction in PCOS patients [20, 21]. Although conventional therapy with ethinylestradiol cyproterone and metformin can improve androgen levels and insulin sensitivity, limitations such as weight gain, gastrointestinal side effects and variable patient compliance are a matter of concern [22].

In contrast, acupoint catgut embedding combined with kidney-tonifying therapy may improve metabolic regulation and reproductive function through continuous acupoint stimulation and modulation of neuroendocrine activity [23–25]. The greater improvement in IR-related parameters observed in the observation group suggests that this integrative intervention may exert beneficial effects on both endocrine balance and ovarian function. Although BMI reduction is less pronounced compared with the metformin-treated group, both groups show overall improvement after treatment, reflecting distinct therapeutic mechanisms between the two interventions.

The herbal components administered, such as antler cream, *Dodder seed*, *Pinellia ternata* and *Angelica sinensis*, act synergistically to reinforce kidney function, regulate menstruation, resolve phlegm and promote blood circulation, collectively supporting hormonal balance and ovarian health [26]. Other herbs, i.e. *Rehmannia glutinosa*, Goji berry, *Poria cocos* and *Gleditsia sinensis*, support Yin-Yang balance, strengthen the spleen and contribute to hormone regulation [27]. It has been confirmed that herbs such as *Angelica sinensis*, *Rehmannia glutinosa* and *Gleditsia sinensis* can reduce hyperinsulinaemia and hyperandrogenaemia, improve ovarian microcirculation and promote follicle development and ovulation [28]. Kidney-tonifying herbs also help regulate the hypothalamic-pituitary-ovarian axis, enhance endometrial receptivity and improve early pregnancy outcomes [29]. Furthermore, phlegm-resolving and blood-activating herbs support ovarian enzyme function and facilitate follicle rupture and ovulation [30].

Regarding safety assessment in the observation group, 6 patients (7.41%) who received acupoint catgut embedding reported mild local soreness or slight redness at the embedding site within 24-48 hr after treatment. These symptoms resolved spontaneously without specific intervention. No allergic reactions or local infections were observed. In addition, 4 patients (4.94%) receiving the kidney-tonifying, phlegm-resolving and blood stasis-removing herbal prescription reported mild nausea or abdominal distension within 1 week after initiation of treatment. These symptoms were alleviated after adjusting the medication timing to 1 hr after meals. Furthermore, liver and kidney function indicators measured at baseline and after 3 months and 6 months showed no significant differences throughout the treatment period (all $P > 0.05$), supporting the overall safety of the intervention.

The superior outcomes observed in the observation group extend beyond biochemical improvement to clinically meaningful outcomes including higher menstrual recovery and ovulation rates as well as greater improvement in PCOSQ scores. These findings suggest that acupoint catgut embedding combined with kidney-tonifying therapy may improve both reproductive function and quality of life in patients with PCOS. Compared with conventional pharmacotherapy, this integrative intervention demonstrates broader benefits in endocrine regulation, IR, ovarian

morphology and patient-reported outcomes.

Several limitations should be acknowledged. First, the retrospective design might have introduced selection bias. Second, the 6-month follow-up period was relatively short and did not allow assessment of long-term efficacy. Third, the absence of a placebo control group limited causal interpretation of the findings. Future prospective randomised controlled trials with larger sample sizes and longer follow-up periods are needed to further validate the clinical efficacy and underlying mechanisms of this integrative treatment strategy.

CONCLUSIONS

Acupoint catgut embedding combined with kidney-tonifying, phlegm-resolving and stasis-removing therapy appears to be an effective therapeutic approach for the management of PCOS. This method not only helps to correct irregular menstruation but also significantly improves polycystic ovarian morphology. Furthermore, it effectively combats IR, regulates disturbed endocrine function and promotes the restoration of normal ovulatory activity.

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