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Acupuncture-induced pain relief and anti-Inflammatory effects in chronic pelvic inflammatory disease: A systematic review and meta-analysis

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Corresponding author:
Ran Wei

wei_ran_1995@163.com

Author Affiliation:
Beijing University of Chinese Medicine.

Wei, R; Huang, ZZ.

ADMINISTRATIVE INFORMATION

Support - None.

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 September 2025 and was last updated on 24 September 2025.

INTRODUCTION

Review question / Objective The objective of this systematic review is to evaluate the efficacy of acupuncture in adult women with chronic pelvic inflammatory disease (CPID) for:

Relieving pain (measured by scales such as the Visual Analog Scale).

Reducing systemic inflammation (measured by biomarkers such as C-reactive protein, interleukin-6, and tumor necrosis factor-alpha).

Improving CPID-specific clinical outcomes (including tubal patency, resolution of pelvic inflammatory masses, and composite symptom scores).

Enhancing quality of life and reproductive outcomes (such as pregnancy rates and reduction in symptom recurrence).

This review aims to synthesize evidence from randomized controlled trials (RCTs) to determine whether acupuncture provides a beneficial effect compared to control interventions (such as sham acupuncture, conventional pharmacological therapy, or no treatment) and to explore the influence of different acupuncture modalities and treatment durations on these outcomes.

Condition being studied Chronic Pelvic Inflammatory Disease (CPID) is a persistent inflammatory condition of the female upper genital tract, including the uterus, fallopian tubes, and ovaries. It is a common long-term complication of acute PID, often resulting from inadequate or incomplete treatment of the initial infection.

The condition is characterized by chronic inflammation, the formation of pelvic adhesions (scar tissue), and microcirculatory disturbances. These pathological changes can lead to significant long-term sequelae, such as fallopian tube blockage or damage, and the formation of pelvic inflammatory masses.

Clinically, CPID primarily manifests as chronic pelvic pain, which is often accompanied by dysmenorrhea (painful periods), dyspareunia (pain during intercourse), and abnormal vaginal discharge. Beyond symptom burden, CPID is a major cause of infertility and ectopic pregnancy due to the structural damage it inflicts on the reproductive organs, severely impacting patients' quality of life and reproductive health.

Conventional medical management typically involves repeated courses of antibiotics and anti-inflammatory drugs. However, these approaches often provide only partial or temporary symptom relief and do not effectively address the chronic adhesive and structural changes. Furthermore, long-term use of medications can lead to side effects and antibiotic resistance. This therapeutic challenge underscores the critical need for effective alternative or complementary treatment strategies, such as acupuncture, which targets pain relief, inflammation modulation, and tissue repair through different mechanisms.

METHODS

Participant or population The population of interest consists of adult women (aged 18 years or older) with a diagnosis of Chronic Pelvic Inflammatory Disease (CPID).

This includes individuals experiencing the long-term sequelae of PID, characterized by symptoms such as chronic pelvic pain, dysmenorrhea, dyspareunia, and signs of persistent pelvic inflammation or adhesion formation, as confirmed by clinical examination and/or imaging studies (e.g., ultrasound, hysterosalpingography). Studies focusing exclusively on patients with acute PID or other non-CPID pelvic conditions (e.g., endometriosis, ovarian cysts) are excluded.

Intervention The intervention of interest is acupuncture therapy, defined as the insertion of fine needles into specific points on the body. This includes, but is not limited to, the following modalities:

Manual Acupuncture: Insertion of needles at defined acupoints with manual manipulation (e.g., lifting, thrusting, rotating) to achieve a characteristic sensation known as "de qi."

Electroacupuncture (EA): A form of acupuncture where a mild electric current is applied to the needles after insertion.

Auricular Acupuncture: Acupuncture performed on specific points on the ear.

Combined Therapies: Acupuncture used in conjunction with other therapies, such as Chinese herbal medicine (oral or topical), where the effects of the combination are evaluated.

Intervention Details:
The review will consider studies reporting on specific aspects of the acupuncture intervention, such as:

Acupoint Selection: The specific acupoints used (e.g., CV4 (Guanyuan), CV6 (Qihai), SP6 (Sanyinjiao), ST29 (Guilai)).

Treatment Regimen: The frequency of sessions (e.g., once daily, every other day), the duration of each session (needle retention time), and the total treatment period (e.g., 4 weeks, 8 weeks).

Technique: Details of needle stimulation (manual or electrical).

Comparator
The intervention will be compared against:

Sham or Placebo Acupuncture (e.g., non-penetrating needles at non-acupoints, superficial needling at non-acupoints).

Conventional Pharmacological Therapy (e.g., antibiotics, anti-inflammatory drugs).

No Treatment or Usual Care/Waiting List.

Co-interventions
Studies where both the intervention and control groups receive the same baseline conventional care (e.g., a standard antibiotic regimen) will be included, provided the effect of acupuncture as an adjunctive therapy can be isolated.

Comparator The intervention (acupuncture) will be compared to the following control conditions:

Sham or Placebo Acupuncture: This includes non-penetrative needling at non-acupoints, superficial needling at incorrect locations, or the use of devices that mimic the sensation of acupuncture without actual needle insertion. This type of control is crucial for assessing the specific effects of acupuncture beyond placebo.

Conventional Therapy: This refers to standard pharmacological treatments for CPID, such as antibiotics (e.g., doxycycline, metronidazole) or

anti-inflammatory medications (e.g., NSAIDs). This comparison evaluates acupuncture's efficacy as an alternative or adjunct to routine medical care.

No Treatment or Usual Care/Waiting List: This comparator assesses the absolute effect of acupuncture against a background of no specific intervention or minimal routine care, where the control group does not receive any active treatment for CPID during the trial period.

Studies where both groups receive the same baseline conventional care will be included, allowing for the evaluation of acupuncture as an adjunctive therapy. The choice of comparator is essential for interpreting whether the benefits of acupuncture are specific to the intervention or related to non-specific effects.

Study designs to be included This systematic review will include randomized controlled trials (RCTs). Eligible RCTs must have:A parallel-group or crossover design.Clearly described random sequence generation methods.A comparator group meeting the defined criteria (sham acupuncture, conventional therapy, or no treatment).We will exclude:Non-randomized studies (e.g., observational studies, case reports, case series).Quasi-randomized trials (e.g., allocation by alternation, date of birth).Reviews, commentaries, and conference abstracts without full data.The inclusion of RCTs is essential to mi.

Eligibility criteria Inclusion Criteria:

Study Design: Randomized Controlled Trials (RCTs).

Participants: Adult women (≥18 years) diagnosed with Chronic Pelvic Inflammatory Disease (CPID).

Intervention: Any form of acupuncture therapy (e.g., manual, electro-, auricular) as either a standalone or adjunctive treatment.

Comparator: Sham/placebo acupuncture, conventional pharmacological therapy, no treatment, or usual care.

Outcomes: Studies must report on at least one of the following:

Pain intensity (e.g., Visual Analog Scale).

Inflammatory biomarkers (e.g., CRP, IL-6, TNF-α).

CPID-specific outcomes (e.g., tubal patency, pelvic mass resolution).

Quality of life or reproductive outcomes (e.g., pregnancy rate, recurrence).

Exclusion Criteria:

Non-RCTs (e.g., observational studies, reviews).

Studies focusing on acute PID or other pelvic pathologies (e.g., endometriosis).

Studies with no control group or irrelevant comparators.

Duplicate publications or studies with insufficient data for analysis.

Information sources PubMed, Embase, Cochrane Library, Chinese National Knowledge Infrastructure (CNKI), and Wanfang Data.

Main outcome(s) Pain Intensity: Measured by change in the Visual Analog Scale (VAS) or other validated pain scales.

Systemic Inflammatory Markers: Changes in serum levels of C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α).

Quality assessment / Risk of bias analysis The methodological quality and risk of bias of included randomized controlled trials (RCTs) will be assessed independently by two reviewers using the Cochrane Risk of Bias tool (RoB 2). This tool evaluates bias across five domains:

Bias arising from the randomization process.

Bias due to deviations from intended interventions.

Bias due to missing outcome data.

Bias in measurement of the outcome.

Bias in selection of the reported result.

Each domain will be judged as "Low risk," "Some concerns," or "High risk" of bias. An overall risk of bias judgment for each study will be determined based on these domain-level judgments.

Disagreements between reviewers will be resolved through discussion or by consulting a third reviewer. The findings will be summarized in a risk of bias table and graph. The overall certainty of evidence will be considered when interpreting the meta-analysis results, with sensitivity analyses planned to explore the impact of excluding studies with a high risk of bias on the pooled results.

Strategy of data synthesis Data synthesis will be performed using RevMan 5.3 and Stata 16. For dichotomous outcomes (e.g., pregnancy rate), the pooled risk ratio (RR) with 95% confidence interval (CI) will be calculated. For continuous outcomes (e.g., pain VAS score, cytokine levels), the standardized mean difference (SMD) or mean difference (MD) with 95% CI will be used, depending on the similarity of measurement scales across studies.

Statistical heterogeneity will be assessed using the I^2 statistic, with I^2 values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. A fixed-effect model will be applied if $I^2 < 50\%$; otherwise, a random-effects model will be used.

If sufficient studies are available, subgroup analyses will be conducted to explore sources of heterogeneity based on acupuncture type, control intervention, and treatment duration. Sensitivity analyses will be performed by excluding studies with a high risk of bias or small sample sizes to test the robustness of the results. Meta-regression will explore the influence of continuous variables (e.g., treatment weeks) on effect sizes. Publication bias will be assessed visually using funnel plots and statistically using Egger's test if more than 10 studies are included in an analysis.

Subgroup analysis Subgroup analysis was conducted by acupuncture type to explore efficacy differences in pain relief (VAS) and CRP reduction for CPID, using data from 10 RCTs (n=505).
For pain relief: Electroacupuncture + herbs (3 studies, n=214) showed the strongest effect (SMD=-1.20, 95%CI:-1.60~-0.80, P<0.001, I^2=45%); traditional acupuncture vs. sham (3 studies, n=158) had moderate efficacy (SMD=-0.55, 95%CI:-0.90~-0.20, P=0.002, I^2=32%); auricular acupuncture (2 studies, n=44) was non-significant (SMD=-0.30, 95%CI:-0.70~0.10, P=0.15, I^2=0%).
For CRP reduction: Electroacupuncture + herbs (2 studies, n=154) had the largest reduction (SMD=-4.20, 95%CI:-5.00~-3.40, P<0.001, I^2=0%); traditional acupuncture (2 studies, n=116) was effective (SMD=-3.10, 95%CI:-4.00~-2.20, P<0.001, I^2=15%); auricular acupuncture (1 study, n=28) was non-significant (SMD=-1.50, 95%CI:-3.50~0.50, P=0.14).
Electroacupuncture combined with herbs exhibited optimal efficacy; auricular acupuncture showed no significant benefits.

Sensitivity analysis Sensitivity analysis was conducted to assess the robustness of the primary findings (pain relief) using data from 10 RCTs (n=505) in the study.
Two key approaches were used: First, excluding small-sample studies (n<20) left 8 studies, with an effect size (SMD=-0.82, 95%CI: -1.18~-0.46, P<0.0001, I^2=70%), consistent with the primary analysis (SMD=-0.85, P<0.0001, I^2=71%). Second, excluding high-risk-of-bias studies retained 6 low-risk studies; the effect size slightly attenuated (SMD=-0.78, 95%CI: -1.15~-0.41, P<0.0001, I^2=68%) but remained statistically significant.
These results confirm the robustness of acupuncture's pain-relieving effect in CPID, as excluding small-sample or high-bias studies did not reverse the significant outcome.

Language restriction English.

Country(ies) involved China.

Keywords Acupuncture; Chronic pelvic inflammatory disease; Tubal patency; Pelvic mass resolution; Pain relief; Anti-inflammatory.

Contributions of each author
Author 1 - Ran Wei - Idea, Methodology, Investigation, Original draft.
Email: wei_ran_1995@163.com
Author 2 - Zhuozhen Huang - Review & editing ,Data curation, Investigation.
Email: huangzuozhen@126.com