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Research article

Best acupuncture method for mammary gland hyperplasia: Evaluation of randomized controlled trials and Bayesian network meta-analysis

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ABSTRACT

Objective: To evaluate the effectiveness of different acupuncture treatments for mammary gland hyperplasia (MGH) using a network meta-analysis.

Methods: Several databases were searched without language restrictions from 2000 to February 2023, including PubMed, Embase, Web of Science, Cochrane Library, China Science and Technology Journal Database, China Biology Medicine Database, Wanfang Database, China National Knowledge Infrastructure Database, and other professional websites and gray literature. Inclusion criteria were adult women diagnosed with MGH; intervention measures included acupuncture and related therapies; the control group was treated with simple drugs; and the research type was a randomized controlled trial (RCT). The primary outcomes were treatment effectiveness and estradiol and progesterone levels. Secondary outcomes were breast lump size and visual analog scale (VAS) score of breast pain. Exclusion criteria were studies unrelated to MGH, incorrect study populations, control measures or interventions, incomplete data, non-RCTs, case reports, and animal experiments. Cochrane tools were used to assess the risk of bias. The R software (x64 version 4.2.1), Review Manager 5.3 software and STATA 16.0 software were used for data analysis.

Results: Following a rigorous screening process, data extraction, and quality assessment, 48 eligible RCTs encompassing 4,500 patients with MGH and 16 interventions were included. The results indicated that acupuncture, alone or in combination with traditional Chinese or Western medicine, had better therapeutic effects than conventional therapy. In terms of effectiveness, warm needle acupuncture was the best choice (94.6%). Bloodletting pricking was the most effective method (85.7%) for lowering progesterone levels. Bloodletting pricking was the most

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effective method (98.3%) for lowering estradiol levels. Manual acupuncture combined with traditional Chinese medicine was the most effective (74.5%) treatment to improve the size of the breast lump. Warm needle acupuncture was the most effective (69.8%) in improving the VAS score.

Conclusion: Acupuncture therapy was more effective in treating MGH than drug therapy alone, and warm needle acupuncture and bloodletting pricking were the two best options. However, larger sample sizes and high-quality RCTs are required.

1. Introduction

Mammary gland hyperplasia (MGH), also known as fibrocystic breast disease, is a non-inflammatory and non-neoplastic degenerative disease [1,2]. Patients with MGH experience breast pain due to the formation of breast lumps. Epidemiological surveys of breast diseases have found that the prevalence of MGH in the general female population is approximately 93.72%. There has been an increase in MGH cases in recent years. The age of onset is increasingly younger and concerns have been raised about the carcinogenic potential of MGH. According to the Union for International Cancer Control, MGH may increase breast cancer risk. According to a 15-year long-term follow-up study, the relative risk of breast cancer in women with MGH compared to women in the general population was 1.5–1.6 [3–7]. Mental health disorders are also associated with MGH, accompanied by reactions of psychological stress, such as depression, anxiety, and insomnia, which can adversely affect the quality of life of people with MGH [8,9].

Regarding general management measures for MGH, mild-to-moderate pain is treated primarily with psychological counseling and lifestyle interventions, and pharmacological support is available for patients with persistent breast pain [10]. Hormonal drugs, such as estrogen receptor modulators and progestin analogs, are effective for severe breast pain; however, these drugs are accompanied by many adverse reactions and lack evidence to support the reversal of histopathologic changes in MGH [11,12]. Therefore, clinicians should thoroughly consider the side effects of these drugs when evaluating their risks and benefits. Regular self-monitoring, follow-up, and nonpharmacological interventions are the main suggestions in international guidelines for women with MGH [13]. The lack of standardized guidance limits the clinical promotion and application of nonpharmacological interventions on a global scale.

Traditional Chinese medicine (TCM) uses acupuncture as an external treatment for chronic pain and is included in evidence-based clinical practice guidelines [14]. It is effective for various breast disorders, such as mastitis [15], anxiety [16], fatigue [17], hot flashes, lymphedema, and other complications caused by postoperative chemotherapy for breast cancer [18]. In addition, acupuncture is effective in treating MGH. Some studies have shown that acupuncture can regulate the hypothalamic-pituitary-gonadal axis by regulating the levels of the corresponding hormones, thus promoting the restoration of breast tissue. In addition, some studies have also pointed out that acupuncture can relieve the immunosuppressed state, promote the recovery of the normal immune response, improve the body's ability to effectively recognize, inhibit, and eliminate breast hyperplasia cells, and ultimately, effectively improve the patient's symptoms. Therefore, acupuncture can improve symptoms of breast hyperplasia and reduce pain through a multi-system, multi-target, and multi-level regulation mechanism [19–21].

Recent meta-analyses have provided moderate-quality evidence that acupuncture therapy can provide better relief from MGH symptoms and pain than drugs alone. However, the number of randomized controlled trials (RCTs) included in these meta-analyses was insufficient to provide high-quality evidence, and there was a lack of direct or indirect comparative analyses of various interventions in the clinical management of MGH [22,23]. Therefore, it is necessary to establish and standardize acupuncture programs to improve decision making in basic clinical MGH.

The efficacy of MGH was primarily assessed based on its clinical validity. Hormone levels are usually diagnosed using progesterone and estradiol as the main objective measurements, while physical signs are assessed using subjective measurements, including the size of the breast lump and the visual analog scale (VAS) [2,13]. However, the results of subjective self-assessment do not always agree with those of objective measures. Therefore, we conducted a systematic review and network meta-analysis (NMA) to inform clinical practice by comparing different acupuncture therapies for patients with MGH. Few studies have compared the effects of specific acupoints on MGH symptoms. Acupuncture point cluster analysis has been performed to understand the correlation between specific acupuncture points and improvements in primary outcomes. Therefore, this study aimed to provide an evidence-based rationale for the efficacy and safety of acupuncture for the treatment of MGH.

2. Methods

2.1. Study registration

This study was registered with INPLASY under the code INPLASY202290058, available at https://inplasy.com/inplasy-2022-9-0058/. This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [24].

2.2. Data sources and searches

From 2000 to February 2023, we searched the literature in several medical databases, including four English databases (PubMed,

Embase, Web of Science, and Cochrane Library) and four Chinese databases (China Science and Technology Journal, China Biology Medicine, Wanfang, and China National Knowledge Infrastructure). In addition, we searched several other data sources and experimental websites, including MEDLINE, PsycINFO, the International Clinical Trials Registry Platform, and ClinicalTrials.gov, and searched for relevant articles from the references of the retrieved studies, related studies by the main authors, dissertations, Google Scholar, OpenGrey, and PROQUEST for additional searches of the gray literature. We did not apply any language restrictions. The complete search strategy report is provided (Supplementary Material 1). We used a strategy of combining these MeSH terms and free words to retrieve relevant literature: "Fibrocystic breast disease" OR "Mammary gland hyperplasia" OR "Fibrocystic disease of the breast" OR "Fibrocystic mastopathy" OR "Breast fibrocystic changes" OR "Adenosis of breast" OR "Breast adenosis" AND "Acupuncture" OR "Moxibustion" OR "Electroacupuncture" OR "Electric acupuncture" OR "Fire needle" OR "Fire acupuncture" OR "Warm acupuncture" OR "Warm needle" OR "Needle warming Moxibustion" OR "Acupoint injection" OR "Acupoint catgut embedding" OR "Bloodletting pricking" OR "Scrapping" AND "Randomized controlled trials" OR "Controlled clinical trials." Chinese keywords included: "Breast hyperplasia" OR "Cyclomastopathy" OR "Lump in the breast" OR "Breast pain" OR "Mastopathy" OR "Fibrocystic disease of the breast" AND "Acupuncture" OR "Moxibustion" OR "Electroacupuncture" OR "Fire needle" OR "Warm acupuncture" OR "Acupoint injection" OR "Acupoint catgut embedding" OR "Bloodletting" OR "Scrapping"OR "Ear acupoint" OR "Cupping" OR "Acupoint herbal patching" AND "Randomized controlled trials" OR "Clinical trials, randomization." Table 1 shows the PubMed retrieval process.

2.3. Study selection

2.3.1. Eligibility criteria

Participants: Adult women (≥18 years), regardless of race, nationality, age, occupation, disease course, or etiology, who were diagnosed with MGH according to the diagnostic criteria of the clinical practice guidelines for the diagnosis and treatment of hyperplasia of the mammary glands or the expert consensus on the clinical diagnosis and treatment of breast hyperplasia with integrated TCM and Western medicine [13,25].

Interventions: The treatment group received a single intervention of acupuncture therapy or a combination of acupuncture therapy with TCM or Western medicine (WM). There were no restrictions on dosage or frequency.

Comparators: TCM or WM was administered alone. To reduce the heterogeneity of the included studies, WM used expert consensus recommendations for tamoxifen or bromocriptine [25]. None of the participants had undergone any other interventions.

Outcomes: The primary outcomes were clinical efficacy and hormone levels, and the secondary outcomes were breast lump size and VAS score of breast pain. The studies had to contain at least one of the following outcome indicators: (1) efficacy assessment based on the MGH evaluation criteria [25], which categorized MGH as significantly better, better, mildly better, or unchanged; (2) hormone levels, including estradiol and progesterone; (3) breast lump size reflected by breast imaging; (4) VAS measured breast pain on a scale of 0–10, with higher scores associated with more severe pain [26].

Study type: RCTs without language restrictions.

2.3.2. Exclusion criteria

(1) Studies not directly related to MGH.
(2) Trials with incorrect study populations, control measures, or interventions.
(3) Non-RCTs, case reports, lessons learned, reviews, studies involving animal testing, and meta-analyses.
(4) Duplicate literature, studies with incomplete data metrics, or studies in which information was not available.

2.4. Data extraction and analysis

To ensure accuracy and transparency, Microsoft Excel 2016 was used to import and manage data. Two researchers (Xing Liwei and He Ming) screened and extracted information from the included studies. A third researcher (Guo Rui) negotiated and resolved

Table 1
Search strategy of PubMed.

No.	Search items
#1	Fibrocystic Breast Disease" [MeSH Terms]
#2	fibrocystic breast disease [Title/Abstract] OR mammary gland hyperplasia [Title/Abstract] OR fibrocystic disease of the breast [Title/Abstract] OR fibrocystic mastopathy [Title/Abstract] OR breast fibrocystic changes [Title/Abstract] OR adenosis of breast [Title/Abstract] OR breast adenosis [Title/Abstract]
#3	#1 OR #2
#4	Acupuncture [Title/Abstract] OR Moxibustion [Title/Abstract] OR Electroacupuncture [Title/Abstract] OR Electric Acupuncture [Title/Abstract] OR Fire needle [Title/Abstract] OR Fire Acupuncture [Title/Abstract] OR Warm Acupuncture [Title/Abstract] OR Warm needle [Title/Abstract] OR Needle warming Moxibustion [Title/Abstract] OR Acupoint injection [Title/Abstract] OR Acupoint catgut embedding [Title/Abstract] OR bloodletting pricking [Title/Abstract] OR Scrapping [Title/Abstract]
#5	randomized controlled trials [Publication Type] OR controlled clinical trials [Title/Abstract]
#6	#3 AND #4 AND #5

disagreements during the extraction. First, the literature was filtered by reading the titles. After excluding irrelevant studies, the abstracts and full texts were reviewed for further review. Information extraction included the following steps.

(1) General information: title of the research article, first author, and publication date.
(2) The specific grouping method used in the study, sample size, age of subjects, interventions implemented, course of treatment followed, and scoring criteria were used to assess the outcomes.
(3) Key elements of the risk of bias evaluation include randomization methods, concealment of allocation, blinding, incomplete outcome data, selective reporting, and other biases.
(4) Extraction of outcome indicators from study results: Sample size and dichotomous and continuous variables.

2.5. Assessment of risk of bias

Two researchers (Haina Zhuang and Hongxi Chen) used the Cochrane Collaboration risk of bias tool to evaluate potential biases in RCTs. Based on the level of possible bias in the evaluation, we classified each study as having a low, high, or unclear risk. When there was uncertainty or disagreement between the two researchers, a third researcher (Kenan Wu) adjudicated and provided the final judgment. The researchers established specific criteria to evaluate the risk of bias in each study. If each risk was assessed as low or if the risk was unclear for only one or two criteria, the bias risk of the study was considered low. However, we classified studies with high-risk factors in any field as having a high bias risk. Experiments that did not meet the low or high-risk criteria were categorized as having an uncertain risk of bias.

2.6. Statistical analysis

We used R (x64 version 4.2.1), Review Manager 5.3 and STATA 16.0 to analyze the data. Outcome measures were expressed as odds ratios (OR) if presented as binary data or as mean difference (MD) if presented as continuous data with a 95% confidence interval (CI). Forest plots were used to represent the direct meta-analysis. If there was no notable heterogeneity, the analysis was conducted using a fixed-effects model ($I^2 < 50\%$). Otherwise, we used a random-effects model.

We used R software (x64 version 4.2.1) and the gemtc BUGSnet package for data analysis, which interfaces with OpenBUGS30 version 3.2.3. Network evidence graphs were generated to visualize the relationships between different interventions. The assumptions of homogeneity and consistency were validated using inconsistent models and node-splitting methods. In addition, the rank

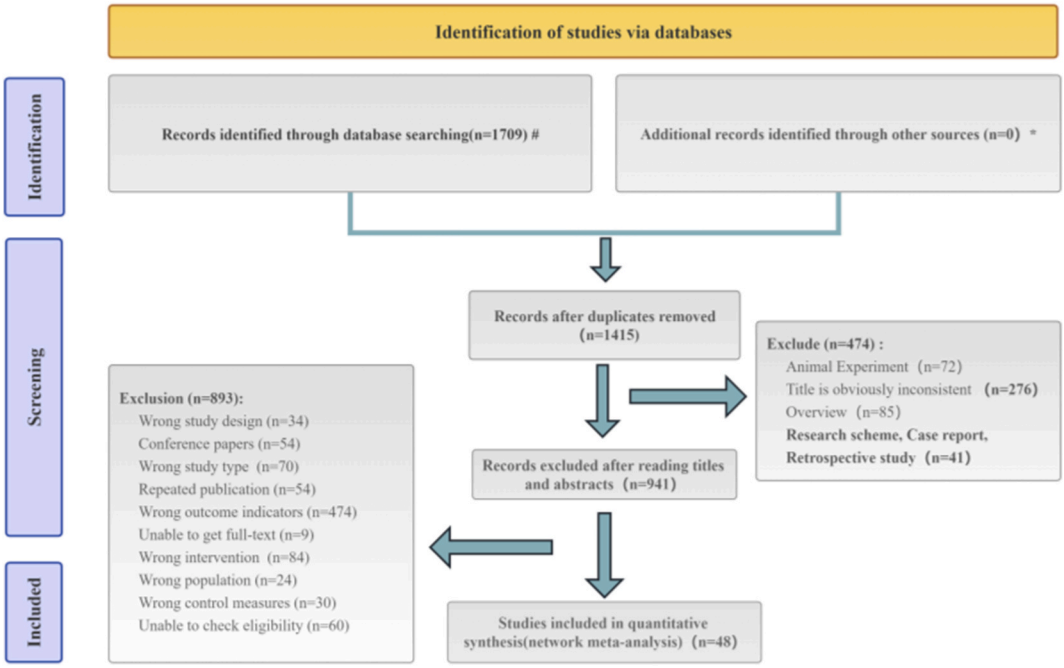

Fig. 1. Flow chart for the search for literature and the inclusion of articles
#: Including four English databases (PubMed, Embase, Web of Science, and Cochrane Library) and four Chinese databases (China Science and Technology Journal Database, China Biology Medicine Database, Wanfang Database, and China National Knowledge Infrastructure Database).
*: Other data sources and experimental websites, including MEDLINE, PsycINFO, International Clinical Trials Registry Platform, and ClinicalTrials.gov and searched for relevant articles from the references of the retrieved studies, related studies by the main authors, dissertations, Google Scholar, OpenGrey, and PROQUEST for additional searches of the gray literature.

probabilities of all treatments at all possible levels can provide a comprehensive understanding of treatment effects. In addition, we generated heat maps that illustrate the hierarchy of processing methods by considering the location and variance of all relative treatment effects. Finally, we evaluated the combined efficacy of acupuncture and MGH based on the surface under the cumulative ranking (SUCRA). We generated a cluster ranking chart to visualize the ranking results. We also used comparison-adjusted funnel plots to assess possible publication bias. Sensitivity analyses were conducted to determine whether the effects of the combined treatment were stable.

We performed a detailed undirected network analysis of the prescription of acupoint combinations in an RCT in MGH. Furthermore, we used Gephi 0.9.2 software to cluster the acupoints based on their interconnections, facilitating a deeper understanding of the network structure. BioRender. com was used to create a humanoid-body template to indicate the location of each cluster of acupoints in the human body.

Table 2
The characteristics of included studies.

No.	Author, year	Sample size		Age: mean (SD) or range		Interventions		Course of treatments	Outcomes
		T	C	T	C	T	C		
1	Zhang (2021)	43	42	33.5 ± 6.1	36.4 ± 5.1	EA	WM	90	①②④⑤
2	Yan et al. (2019)	52	52	35.4 ± 7.6	35.7 ± 7.5	WA	Massage	10	①②③④⑤
3	Duet al. (2020)	30	30	36 ± 7.25	35 ± 8.55	MA + TCM	TCM	30	①②③④⑤
4	Yang (2021)	58	57	36 ± 5	36 ± 6	MA + TCM + WM	WM	56	①④⑤
5	Zhou et al. (2019)	62	62	42.78 ± 4.15	41.98 ± 4.20	MA	MA	90	①④⑤
6	Lin (2022)	40	40	30.02 ± 5.44	30.51 ± 5.46	MA + TCM	TCM	90	①③④⑤
7	He and Wang (2020)	43	43	44.85 ± 2.52	44.81 ± 2.49	MA + TCM	TCM	90	①④⑤
8	Zheng et al. (2008)	30	30	22–55	22–55	MA	WM	90	①④⑤
9	Yan et al. (2019)	45	45	34.49 ± 4.5	34.38 ± 4.5	MA + Moxibustion	TCM	90	①④⑤
10	Yan et al. (2021)	60	60	37 ± 9	38 ± 9	MA + Moxibustion	TCM	90	①②③④⑤
11	Zhan et al. (2011)	44	42	34.0 ± 2.5	35.0 ± 4.1	MA + TCM	WM	90	①④⑤
12	Ma (2022)	35	35	41.21 ± 6.77	42.16 ± 6.34	ACE	TCM	90	①
13	Feng et al. (2021)	50	50	44.40 ± 5.76	44.26 ± 5.63	MA + TCM	TCM	30	①②③④⑤
14	Wang et al. (2017)	48	46	35.7 ± 7.2	36.2 ± 6.7	MA	MA	36	①④⑤
15	Liu (2014)	100	100	33	33	MA + TCM	TCM	90	①②⑤
16	Chen et al. (2019)	30	30	36.7 ± 4.1	35.3 ± 4.9	AHP	TCM	60	①③④
17	Wang et al. (2020)	40	40	46.35 ± 3.21	47.31 ± 3.25	ACE	MA	90	①②③
18	Zhou. (2021)	40	40	36.22 ± 8.18	36.25 ± 8.37	ACE	TCM	90	①③
19	Huo et al. (2015)	60	50	31.1	31.1	ACE	MA	90	①
20	Chen et al. (2011)	40	40	36.22 ± 8.18	36.25 ± 8.37	ACE	TCM	90	①②⑤
21	Li et al. (2020)	60	60	32.9 ± 5.7	32.5 ± 5.3	BP	WM	30	①④⑤
22	Qiu et al. (2022)	50	50	36.84 ± 8.94	37.28 ± 9.31	Massage	TCM	10	①
23	Wen. (2019)	50	50	38.63 ± 3.76	38.45 ± 3.66	AHP	TCM	90	①②④⑤
24	Qian. (2021)	49	49	30 ± 6	32 ± 6	MA + Moxibustion	WM	56	①③④⑤
25	Tan et al. (2021)	60	60	30.52 ± 5.32	30.23 ± 5.12	WA	TCM	90	①②⑤
26	Fu et al. (2021)	30	30	36.39 ± 2.26	35.36 ± 2.20	WA	Massage	60	①④⑤
27	Chen et al. (2020)	80	80	39.6 ± 1.5	39.3 ± 1.4	BC	Massage	28	①③④⑤
28	Yang. (2017)	48	48	35.5 ± 3.7	33.8 ± 3.4	MA + TCM	WM	60	①②③④⑤
29	Ke et al. (2016)	32	32	32.5 ± 6.7	31.8 ± 6.3	MA + TCM	TCM	60	①④⑤
30	Zhang et al. (2022)	45	45	34.15 ± 4.21	34.27 ± 4.35	AHP	TCM	120	①③④
31	Chen. (2020)	35	35	38.5 ± 1.8	37.5 ± 1.9	MA + TCM	MA	90	①②④⑤
32	Kang et al. (2021)	43	43	33.2 ± 2.4	33.5 ± 2.7	MA + TCM + WM	WM	90	①③⑤
33	Li. (2015)	20	18	28.24 ± 11.28	28.24 ± 11.28	Scrapping	TCM	15	①④⑤
34	Zeng et al. (2011)	34	32	34 ± 3	35 ± 4	MA	Moxibustion	90	①②④
35	Jin et al. (2020)	40	40	36.47 ± 1.35	36.87 ± 1.44	MA + TCM	TCM	90	① ②③⑤
36	Pan et al. (2022)	29	29	18–50	18–50	Moxibustion	TCM	60	①②③④
37	Sun et al. (2021)	56	56	42.5 ± 2.7	44.3 ± 2.1	MA	WM	90	①③⑤
38	Xiong. (2012)	73	68	19 ~ 47	20 ~ 49	MA + TCM	MA	60	①④⑤
39	Huang et al. (2014)	50	50	18 ~ 52	19 ~ 52	MA + TCM	TCM	90	①②
40	Dong. (2019)	30	30	36.62 ± 4.50	34.26 ± 3.68	MA + TCM	MA	30	①②③⑤
41	Zhang et al. (2008)	100	50	41.5	40.5	MA	TCM	60	①②③⑤
42	Zhang et al. (2019)	72	72	36 ± 14	36 ± 14	EA	MA	30	①②③④⑤
43	Lv. (2019)	64	64	36.58 ± 4.88	36.74 ± 4.96	EA + BP	WM	60	①③④⑤
44	Zhou. (2014)	24	24	32.4 ± 5.9	35.4 ± 4.9	EA	WM	90	①②④⑤
45	Wang et al. (2021)	50	50	36.02 ± 5.32	36.62 ± 5.49	MA + TCM	TCM	90	①②③④⑤
46	Liu et al. (2022)	30	30	33.43 ± 5.58	33.40 ± 5.31	MA + TCM	MA	30	①②③④⑤
47	Gao et al. (2020)	30	30	36.25 ± 2.14	36.23 ± 2.11	MA + TCM + WM	WM	90	①③⑤
48	He et al. (2021)	54	53	33.51 ± 3.22	33.55 ± 3.25	MA + TCM + WM	WM	90	①③④⑤

MA: manual acupuncture; EA: electroacupuncture; BP: bloodletting pricking; WA: warm needle acupuncture; ACE: acupoint catgut embedding; AHP: acupoint herbal patching; BC: Bloodletting and cupping; TCM: Traditional Chinese medicine; WM: Western medicine. Outcomes: ① effectiveness, ② vas score, ③ breast lump size, ④ progesterone, ⑤ estradiol.

3. Results

3.1. Study selection

Our search identified 1709 studies in the databases. A total of 941 studies were reviewed after duplicates were removed. Finally, 48 studies were included in the analysis [27–74]. The screening process is illustrated in Fig. 1.

3.2. Document characteristics

A comprehensive analysis of the 48 studies [27–74] is listed in Table 2. These studies included a large sample of 4,500 patients with MGH. All trials were conducted in China between 2008 and 2023. The patient populations in these studies had a wide age range, with a median age of 35 years. All studies reported effectiveness with a change from baseline to the endpoint. Additionally, 22 RCTs reported VAS scores for breast pain, 24 reported breast lump size, 33 reported changes in progesterone levels, and 38 reported changes in estradiol levels (Table 2).

3.3. Risk of bias

We evaluated the risk of bias in 48 RCTs (Figs. 2–3) and judged that 45 RCTs had a low risk of random sequence generation. We defined three studies assigned in numerical order as high-risk because they did not follow the principle of random grouping, which means that they may have potential bias [36,69,71]. The other two studies showed a risk of missing visit bias due to incomplete data and did not provide detailed reports on the handling of missing data, which lacks transparency and increases the uncertainty of data analysis [40,44]. Considering these factors, we defined all five studies as high-risk [36,40,44,69,71]. Not all literature provides detailed descriptions of concealment allocation, including how researchers divided subjects into different groups or what randomization methods were used. Due to the lack of detailed information, we classified these studies as having uncertain risk. Only a few studies explicitly stated that they adopted double- or single-blind study designs, which means that there were differences in the perception of treatment measures between researchers and subjects during the study process. Compared to other studies, those using double- or single-blind designs have lower risk because their experimental results are more objective.

3.4. Primary outcome

3.4.1. Effectiveness

3.4.1.1. Meta-analysis of effectiveness. The effectiveness rates were discussed in all 48 included studies, which included 4,500 patients. When $p = 1$ and $I^2 = 0\%$, a meta-analysis was performed using a fixed-effects model. The analysis showed that the effectiveness was significantly higher in the experimental group than in the control group, and the difference was statistically significant (OR = 4.24, 95% CI = [3.48, 5.15], $p < 0.05$) (Supplementary Material 2, Fig. S1).

3.4.1.2. NMA of effectiveness. The NMA included 16 intervention measures. The results showed that compared to TCM alone, MA + TCM had the highest number of studies (eight) and the largest sample size (870 cases), and the evidence network formed six closed loops. Fig. 4A shows an efficient evidence network.

We used inconsistent models to test their effectiveness due to the formation of six closed loops. The results showed $p = 0.285$ ($p > 0.05$), indicating that the inconsistencies are not significant. Furthermore, a node-splitting method is used to test for local inconsistencies. The results did not show significant differences between the direct and indirect comparisons of the intervention measures ($p > 0.05$), indicating acceptable consistency. We then performed an NMA using consistent models.

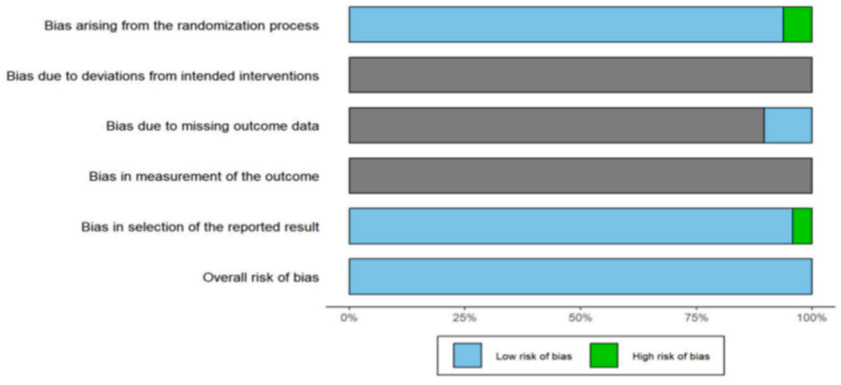

Fig. 2. Reviewers' judgments regarding each risk of bias item are presented as percentages in all eligible studies.

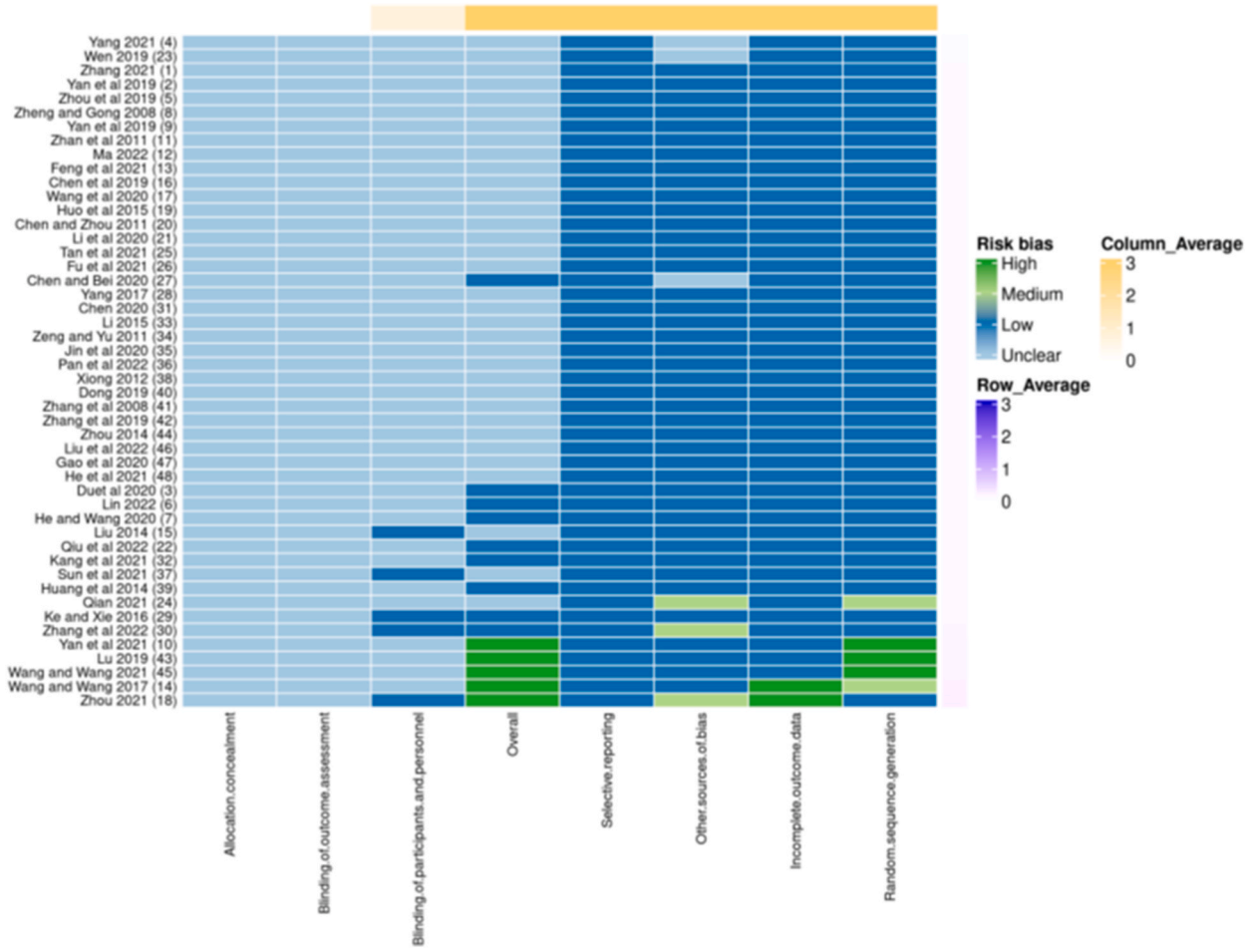

Fig. 3. Risk of bias summary showing the judgments of the reviewers about each risk of bias item for eligible studies.

Table S1 in Supplementary Material 3 shows the results of the reticulated meta-analysis on the efficacy of the included RCTs. The analysis showed that WA and MA + TCM showed statistically significant differences compared to the TCM control (OR = 2.62, 95% CI [1.76, 3.47]; OR = 1.54, 95% CI [1.12, 1.96]) ($p < 0.05$). WA also showed a significant difference compared to control WM (OR = 2.55, 95% CI [1.57, 3.54]) ($p < 0.05$). Additionally, WA was significantly superior to moxibustion (OR = 2.38, 95% CI [1.07, 3.69]) ($p < 0.05$).

In terms of SUCRA values, WA had the highest probability of ranking first (94.6%), followed by massage (69.4%), MA + moxibustion (68.4%) and MA + TMC + WM (65.3%) (Fig. 5A).

3.4.2. Progesterone

3.4.2.1. Meta-analysis of progesterone. A total of 33 RCTs that included 3012 patients were included, 1514 and 1498 patients in the experimental and control groups, respectively. The results of the heterogeneity test showed a high degree of interstudy heterogeneity (I^2 = 93%). The meta-analysis of the random-effects model showed that progesterone levels were significantly elevated in the experimental group compared to those in the control group (SMD = 1.32, 95% CI [1.01, 1.62], $p < 0.05$) (Supplementary Material 2, Fig. S2).

3.4.2.2. NMA of progesterone. The NMA included 14 intervention measures. Compared to TCM alone, the results showed that MA + TCM had the highest number of studies (7) and the largest sample size (419 cases), and the evidence network formed one closed loop. Fig. 4B shows the progesterone-level evidence network.

Due to closed-loop formation, we used inconsistent models to determine progesterone levels. The results showed $p = 0.833$ ($p > 0.05$), indicating that the inconsistencies were not statistically significant. Furthermore, we performed a regional inconsistency test using the node-splitting method and the results did not show significant differences between direct and indirect comparisons of intervention measures ($p > 0.05$), indicating strong consistency.

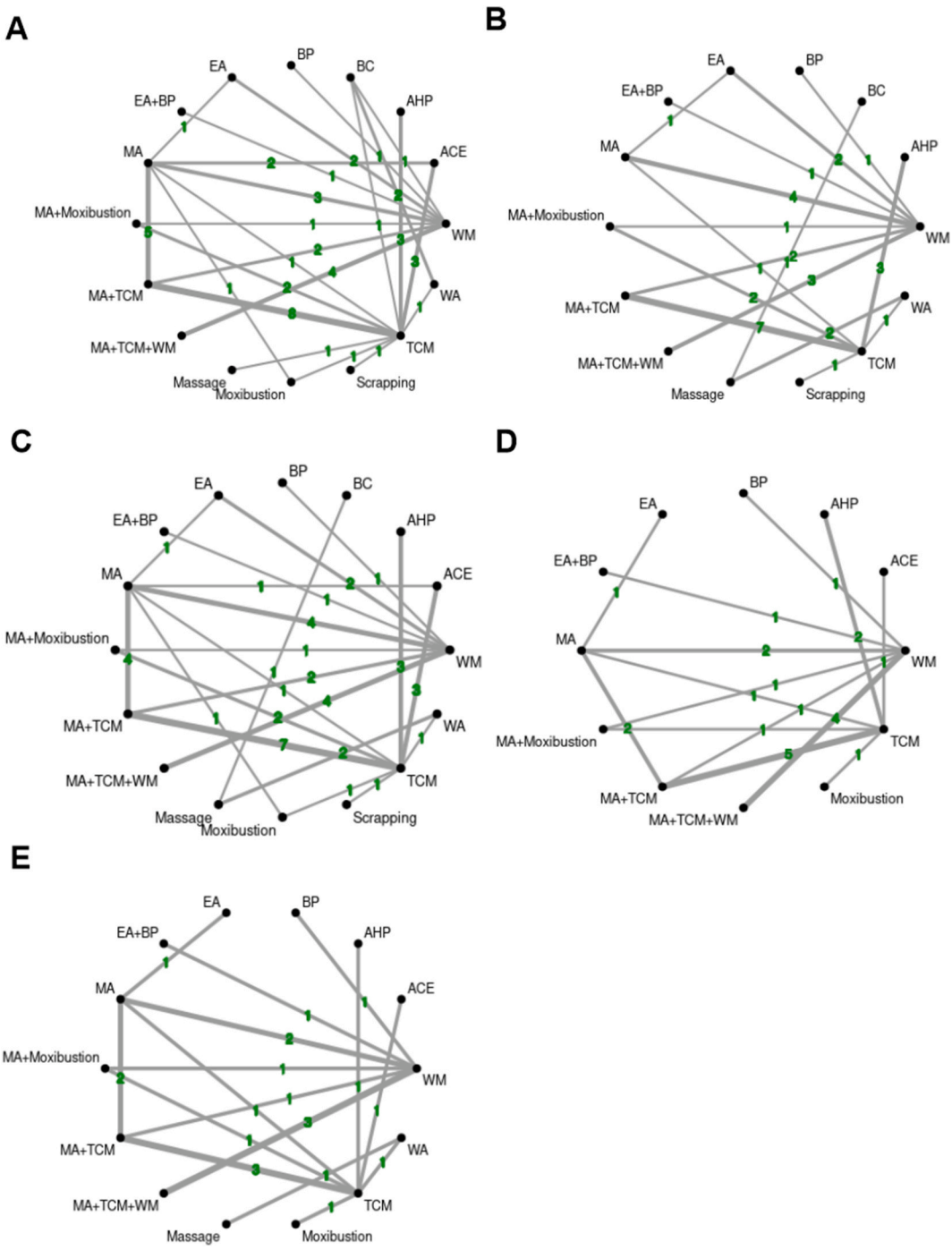

Fig. 4. Network of intervention treatments included in the meta-analysis
The size of each node represents the sample size. The thickness of each line indicates the number of studies included in the comparison. The closed loop is shown in dark gray. (A) Effectiveness, (B) Progesterone level, (C) Estradiol level, (D) Breast lump size, and (E) VAS score. MA: manual acupuncture; EA: electroacupuncture; BP: bloodletting pricking; WA: warm needle acupuncture; ACE: acupoint catgut embedding; AHP: acupoint herbal patching; BC: bloodletting and cupping; TCM: traditional Chinese medicine; WM: Western medicine.

Thirteen interventions showed significant differences compared to scraping: BP, WA, MA + moxibustion, BC, EA, MA + TCM, AHP, MA + TCM + WM, massage, MA, TCM, EA + BP, and WM: MD = 7.2, 95% CI [4.48, 9.93]; MD = 6.96, 95% CI [4.39, 9.54]; MD = 6.75, 95% CI [4.58, 8.91]; MD = 6.92, 95% CI [3.62, 10.21]; MD = 6.26, 95% CI [3.92, 8.6]; MD = 6.01, 95% CI [4.01, 8.01]; MD = 5.79, 95% CI [3.65, 7.94]; MD = 5.58, 95% CI [3.23, 7.93]; MD = 5.52, 95% CI [2.68, 8.35]; MD = 5.44, 95% CI [3.25, 7.62]; MD = 5.06,

Fig. 5. Surface under the cumulative ranking curves (SUCRA) (A) Effectiveness, (B) Progesterone, (C) Estradiol, (D) Breast lump size, (E) VAS score. A: EA, B: WA; C: MA + TCM; D: MA + TCM + WM; E: MA; F: MA + moxibustion; G: ACE; H: AHP; I: BP; J: massage; K: BC; L: scraping; M: moxibustion; N: EA + BP; O: TCM; P: WM.

95% CI [3.15, 6.97]; MD = 4.39, 95% CI [1.64, 7.13]; and MD = 4.5, 95% CI [2.36, 6.64], respectively) ($p < 0.05$). BP and MA + moxibustion showed statistically significant differences compared to WM (MD = 2.7, 95% CI [1.01, 4.4] and MD = 2.24, 95% CI [1.07, 3.42], respectively) ($p < 0.05$) (Supplementary Material 3, Table S2).

The SUCRA probability ranking was as follows: BP (85.7%) was more effective than the other therapies, followed by WA (82.7%), MA + moxibustion (80.4%), and BC (77.5%) (Fig. 5B).

3.4.3. Estradiol

3.4.3.1. Meta-analysis of estradiol. A total of 38 RCTS that included 3546 patients were included (1805 and 1741 patients in the experimental and control groups, respectively). The results of the heterogeneity test showed a high degree of interstudy heterogeneity ($I^2 = 97\%$). The meta-analysis of the random-effects model showed that estradiol levels were significantly lower in the experimental group than in the control group (SMD = −1.86, 95% CI [−2.30, −1.43], $p < 0.05$) (Supplementary Material 2, Fig. S3).

3.4.3.2. NMA of estradiol. The NMA included 14 intervention measures. Compared to TCM alone, the results showed that MA + TCM had the highest number of studies (seven) and the largest sample size (390 cases), and the evidence network formed three closed loops. Fig. 4C shows the evidence network.

Because of the formation of three closed loops, we used inconsistent models to detect estradiol levels. The results showed $p = 0.833$ ($p > 0.05$), indicating that the inconsistencies were not statistically significant. In addition, we used the node-splitting method for local inconsistency testing, and the results did not show significant differences between direct and indirect comparisons of intervention measures ($p > 0.05$).

Seven interventions showed significant differences compared to WM: BP, BC, MA + moxibustion, MA + TCM, AHP, MA + TCM + WM, and MA: MD = −8.39, 95% CI [−11.41, −5.37]; MD = −5.84, 95% CI [−10.57, −1.1]; MD = −3.49, 95% CI [−5.42, −1.56]; MD = −2.44, 95% CI [−3.72, −1.16]; MD = −2.5, 95% CI [−4.72, −0.29]; MD = −2.02, 95% CI [−3.44, −0.6]; and MD = −1.57, 95% CI [−2.69, −0.45]), respectively ($p < 0.05$). Five interventions showed significant differences compared to TCM: BP, BC, MA + moxibustion, MA + TCM, and AHP: MD = −8.15, 95% CI [−11.51, −4.79]; MD = −5.59, 95% CI [−10.09, −1.09]; MD = −3.25, 95% CI [−4.97, −1.52]; MD = −2.2, 95% CI [−3.19, −1.21]; and MD = −2.26, 95% CI [−3.91, −0.61]), respectively ($p < 0.05$). BP and BC showed statistically significant differences compared to scraping (MD = -7.97, 95% CI [−12.38, −3.55]; and MD = −5.41, 95% CI [−10.74, −0.08], respectively) ($p < 0.05$). BP, BC, and MA + moxibustion showed significant differences compared to EA (MD = −7.77, 95% CI [−11.22, −4.32]; MD = −5.22, 95% CI [−10.18, −0.25]; and MD = −2.87, 95% CI [−5.35, −0.39], respectively) ($p < 0.05$). In addition, BP was significantly better than AHP, MA + TCM + WM, MA, and EA + BP; the differences were statistically significant (MD = −5.89, 95% CI [−9.63, −2.14]; MD = −6.37, 95% CI [−9.7, −3.03]; MD = −6.82, 95% CI [−10.04, −3.61]; and MD = −6.99, 95% CI [−11.12, −2.86], respectively) ($p < 0.05$) (Supplementary Material 3, Table S3).

The probability ranking of SUCRA was as follows: BP (98.3%) showed the best efficacy, followed by BC (89%), MA + moxibustion (74.9%), and massage (65.3%) (Fig. 5C).

3.5. Secondary outcomes

3.5.1. Breast lump size

3.5.1.1. Meta-analysis of breast lump size. A total of 24 RCTs that included 2228 patients were included, with 1140 and 1088 patients in the trial and control groups, respectively. Meta-analysis using a random-effects model showed significant heterogeneity of the studies ($I^2 = 95\%$); meta-analysis of the random-effects model showed a significant reduction in breast lump size in the acupuncture-related treatment group compared to drug treatment alone, and the difference was statistically significant (SMD = −2.28, 95% CI [−2.77, −1.79], $p < 0.05$) (Supplementary Material 2, Fig. S4).

3.5.1.2. NMA of breast lump size. The NMA included 12 intervention measures. The results showed that compared to TCM alone, MA + TCM had the highest number of studies (five) and the largest sample sizes (420 cases), and the evidence network formed two closed loops. Fig. 4D shows the evidence network.

Owing to the formation of two closed loops, we initially examined the size of the breast mass using an inconsistent model. The results were $p = 0.571$ ($p > 0.05$), indicating that the inconsistency was not statistically significant. Furthermore, we designed a node-splitting method to perform local inconsistency tests, and the results did not show significant differences between direct and indirect comparisons of intervention measures ($p > 0.05$), indicating strong consistency.

Five interventions showed significant differences compared to WM: MA + TCM, EA, MA + TCM + WM, MA, and MA + moxibustion: MD = −3.85, 95% CI [−5.96, −1.73]; MD = −4.07, 95% CI [−7.94, −0.21]; MD = −3.58, 95% CI [−5.29, −1.88]; MD = −3.29, 95% CI [−5.26, −1.33]; and MD = −3.28, 95% CI [−5.92, −0.65], respectively) ($p < 0.05$). MA + TCM was significantly superior to TCM (MD = −2.46, 95% CI [−3.84, −1.08]) ($p < 0.05$) (Supplementary Material 3, Table S4).

The probability ranking of SUCRA was as follows: MA + TCM (74.5%) showed the best efficacy, compared to other treatment types, followed by electroacupuncture (72.1%), MA + TCM + WM (67.3%), and MA (61.5%) (Fig. 5D).

3.5.2. VAS score

3.5.2.1. Meta-analysis of the VAS score. A total of 22 RCTs that included 2093 patients were included, with 1073 and 1020 patients in the trial and control groups, respectively. The results of the heterogeneity test showed a high degree of interstudy heterogeneity ($I^2 = 97\%$). The meta-analysis of the random-effects model showed that the improvement in VAS scores was greater in the acupuncture-related treatment group than in the medication-only group, and the difference was statistically significant (SMD = −2.97, 95% CI [−3.61, −2.33], $p < 0.05$) (Supplementary Material 2, Fig. S5).

3.5.2.2. NMA of VAS score. The NMA included 14 intervention measures. The results showed that compared to TCM alone, MA + TCM had the highest number of studies (three) and the largest sample size (208 cases), and the evidence network formed two closed loops (Fig. 4E).

We initially examined the VAS scores using inconsistent models owing to the formation of two closed loops. The results showed $p = 0.897$ ($p > 0.05$), indicating that the inconsistency was not statistically significant. In addition, we used the node-splitting method for local inconsistency tests, and the results did not show significant differences between direct and indirect comparisons of intervention measures ($p > 0.05$), indicating strong consistency.

Seven interventions showed significant differences compared to WM: MA + TCM, MA, MA + moxibustion, AHP, BP, MA + TCM + WM, and BC: MD = −2.44, 95% CI [−3.72, −1.16]; MD = −1.57, 95% CI [−2.69, −0.45]; MD = −3.49, 95% CI [−5.42, −1.56]; MD = −2.5, 95% CI [−4.72, −0.29]; MD = −8.39, 95% CI [−11.41, −5.37]; MD = −2.02, 95% CI [−3.44, −0.6]; and MD = −5.84, 95% CI [−10.57, −1.1], respectively) ($p < 0.05$). BP demonstrated significant differences compared to EA + BP (MD = −6.99, 95% CI

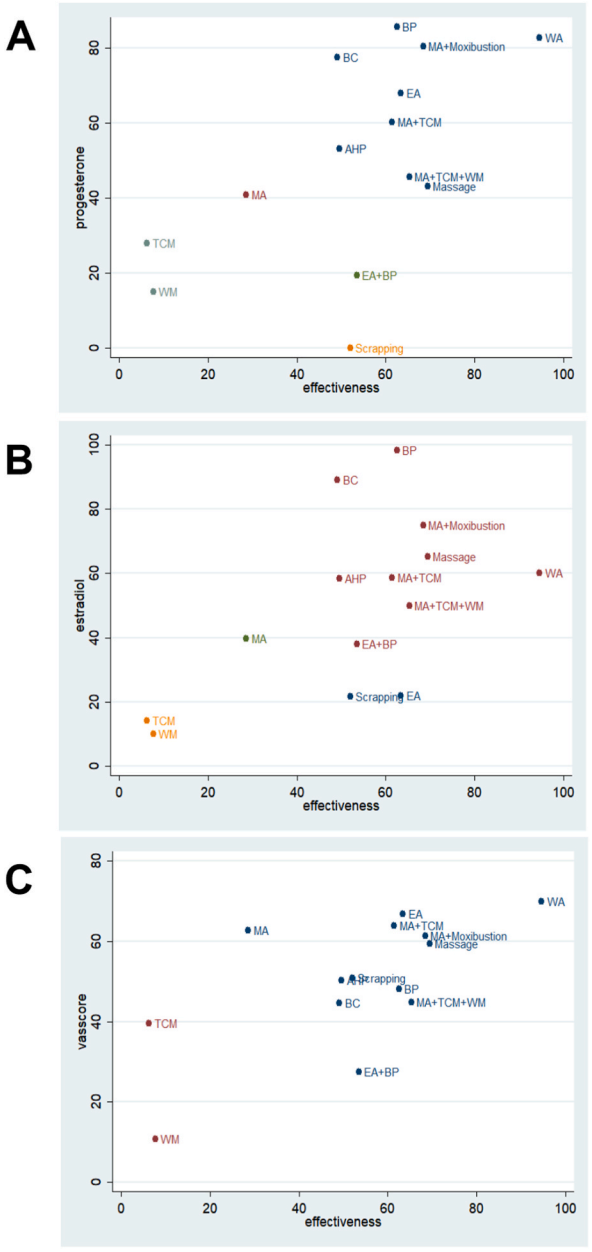

Fig. 6. Comprehensive efficacy sequence analysis
From the upper-right corner to the lower-left corner, the comprehensive effect gradually weakens. (A) Effectiveness against progesterone, (B) effectiveness against estradiol, and (C) Effectiveness and VAS scores.

[−11.12, −2.86]) ($p < 0.05$). The four interventions showed substantial differences compared to TCM: MA + moxibustion, AHP, BP, and BC: MD = −3.25, 95% CI [−4.97, −1.52]; MD = −2.26, 95% CI [−3.91, −0.61]; MD = −8.15, 95% CI [−11.51, −4.79]; and MD = −5.59, 95% CI [−10.09, −1.09], respectively) ($p < 0.05$). Furthermore, BP was superior to MA + TCM + WM, with a statistically significant difference (MD = −6.37, 95% CI [−9.70, −3.03]) ($p < 0.05$). Seven interventions showed significant differences compared to BP: WA, EA, MA + TCM, MA, MA + moxibustion, scraping, and AHP: MD = 5.56, 95% CI [1.15, 9.97]; MD = 7.77, 95% CI [4.32, 11.22]; MD = 5.95, 95% CI [2.67, 9.23]; MD = 6.82, 95% CI [3.61, 10.04]; MD = 4.9, 95% CI [1.32, 8.48]; MD = 7.97, 95% CI [3.55, 12.38]; and MD = 5.89, 95% CI [2.14, 9.63], respectively) ($p < 0.05$) (Supplementary Material 3, Table S5).

The SUCRA probability ranking was as follows: WA (69.8%) showed the best efficacy compared to other treatments, followed by electroacupuncture (66.8%), MA + TCM (63.8%), and MA (62.6%) (Fig. 5E).

3.6. Multidimensional efficacy analysis

Cluster analysis was used to combine the SUCRA values for effectiveness, progesterone and estradiol levels, and VAS scores to identify the most effective interventions. Cluster analysis revealed that WA had the highest SUCRA values of 94.6%, 82.7%, 60.1%, and 69.8%, respectively, among all eligible interventions. Then there was BP, with SUCRA values of 62.5%, 85.7%, 98.3%, and 48%, respectively. Fig. 6 (A – C) shows the comparative effectiveness sequence analysis. Based on a ranking chart (Fig. 7) and ranking table heat plots (Fig. 8), WA showed the best efficacy compared to the other treatment types.

3.7. Publication bias

To compare and adjust each result, we created a contour-enhanced funnel plot (Fig. 9), which showed that most of the data points were evenly distributed on both sides of the centerline and concentrated in the middle area. This indicates that the sample size of this study was sufficient. The Egger's test was $p = 0.3767$ suggesting that there was no publication bias. The graph shows that ten studies were distributed in the white areas (not statistically significant), indicating publication bias. After applying the trim-and-fill method, an additional 12 studies were required to correct for chart asymmetry. (Fig. 9).

We conducted a sensitivity analysis to further examine the stability of our findings. This analysis excluded one study at a time to assess its impact on the CI. The removal of any study did not significantly change the expected CI, indicating the stability of the pooled results. This is shown in Fig. 10 (A - E).

3.8. Network analysis of the acupoints used in RCTs

The results showed 76 nodes in the acupuncture prescription for the treatment of MGH, and 337 groups of points were matched. The maximum value of this complex network was 15, involving 19 core acupoints: GB21, PC6, ST15, EX-CA1, KI3, LR14, CV17, ST36, SP10, KI16, LR3, SP6, LI11, GV20, ST40, LU1, CV12, LU10, and Ashi. As shown in Fig. 11 (A - B). These results suggest that this combination can serve as the core acupoint for the clinical acupuncture treatment of MGH. The most common combinations of coupled acupoints used to treat MGH were PC6– KI3 (weight = 48), PC6-GB21 (weight = 46), PC6-LR14 (weight = 45), GB21-KI3 (weight = 36), and GB21-LR14 (weight = 32).

Based on the data statistics, the network diameter of the acupoint combinations was four, the average path length was 1.577, and

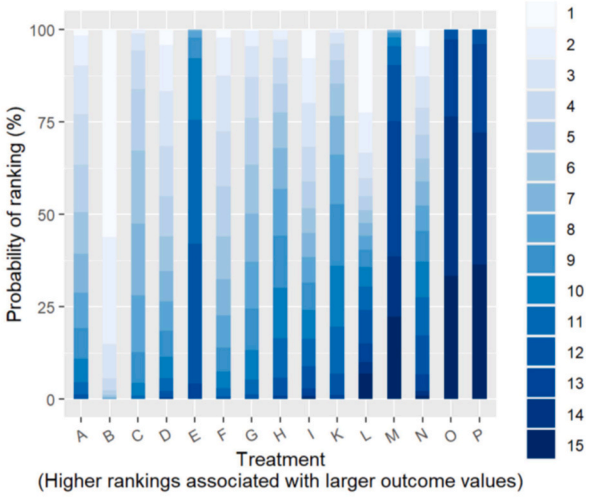

Fig. 7. Ranking chart of the effect rate.
A: EA; B: WA; C: MA + TCM; D: MA + TCM + WM; E: MA; F: MA + moxibustion; G: ACE; H: AHP; I: BP; J: massage; K: BC; L: scraping; M: moxibustion; N: EA + BP; O: TCM; P: WM.

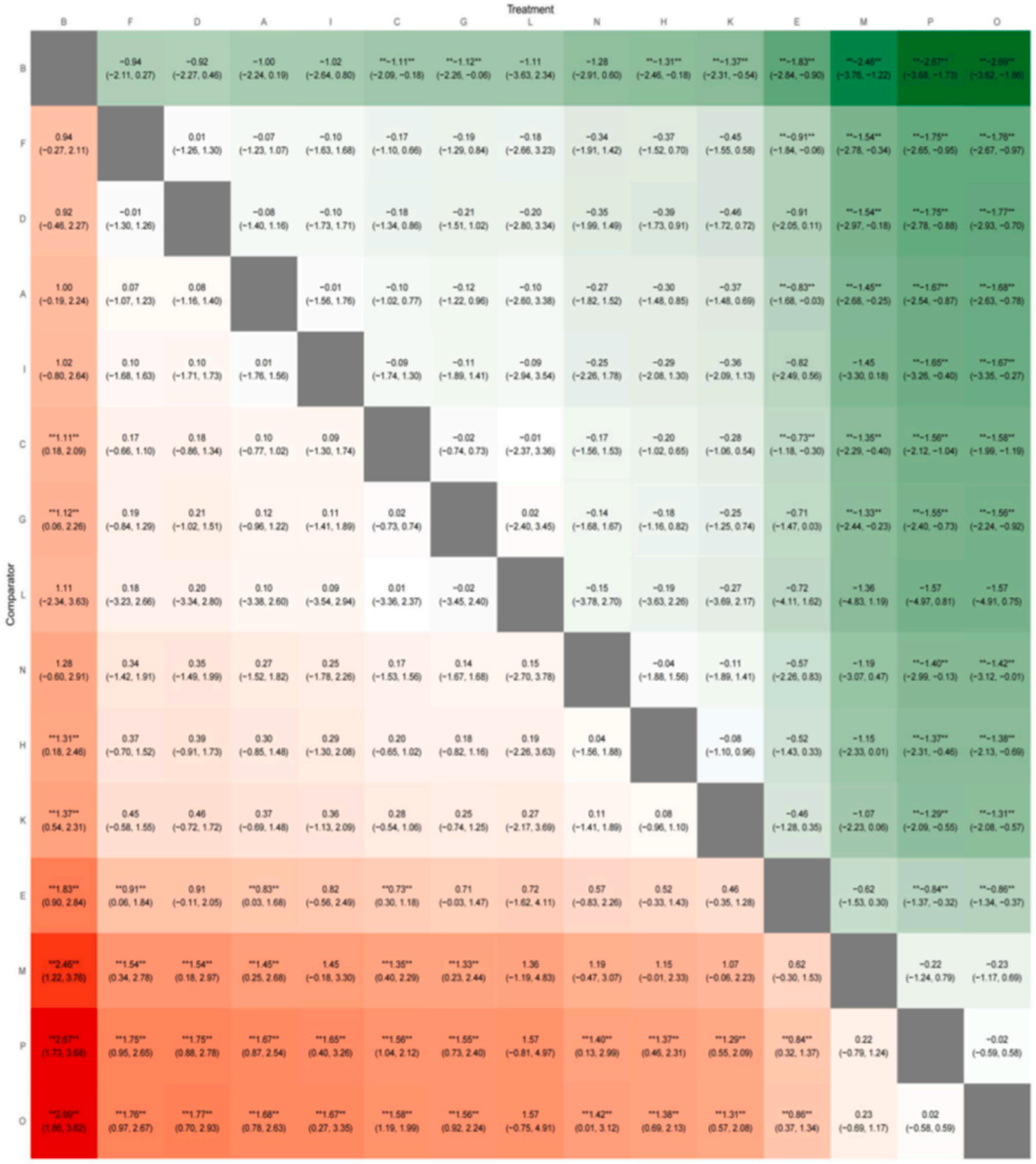

Fig. 8. Ranking table heat plots
The heat plots of the ranking table are used to compare the relative effects of any pair of interventions. A, EA; B, WA; C, MA + TCM; D, MA + TCM + WM; E, MA; F, MA + moxibustion; G, ACE; H, AHP; I, BP; J, massage; K, BC; L, scraping; M, moxibustion; N, EA + BP; O, TCM; P, WM.

the clustering coefficient was 0.812 (Supplementary Material 3, Table S6). According to the modularity analysis using Gephi, the acupoints used for MGH were grouped into three clusters (Fig. 11A). Acupoints in the gallbladder meridian (GB), pericardium meridian (PC), kidney meridian (KI), and liver meridian (LR) were grouped into cluster 1 (pink cluster); spleen meridian (SP) and extra points were grouped into cluster 2 (green cluster); and stomach meridian (ST), conception vessel (CV), SP, large intestine meridian (LI), governor vessel (GV), and lung meridian (LU) were grouped into cluster 3 (blue cluster), most of them located in the chest and legs (Fig. 11B) and belonging to ST. The results showed that ST was the most indispensable channel for the acupuncture treatment of MGH, followed by CV and LR. There was perfect consistency between the centrality regression curves of the acupoint nodes and the degree values. Fig. 12 shows the relationship between the closeness centrality regression curve of the acupoint nodes and degree values. Table S6 in Supplementary Material 3 shows that the top 19 acupoints for betweenness centrality are not entirely consistent with the core prescription acupoints, with GB21, PC6, KI3, LR14, CV17, LR3, EX-CA1, SP6, ST40, ST36, ST15, CV12, KIl6, LU10, LU1, SP10, LI11, GV20, and Ashi in descending order.

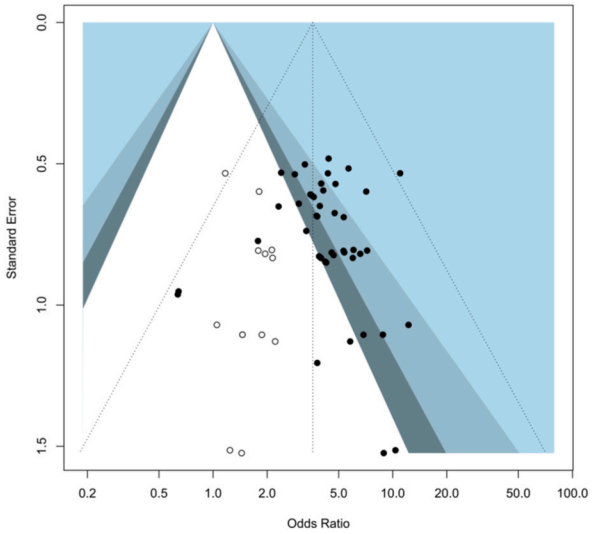

Fig. 9. Effectiveness contour enhancement funnel plot.

4. Discussion

4.1. Research significance

Recent research has discovered a subtype of MGH called atypical MGH. Epidemiological studies have shown that the risk of secondary breast cancer in with atypical MGH is approximately 1.5–2 times higher than in normal women [75]. Currently, a complete understanding of the pathogenesis of MGH is not available, and modern medicine has found that the pathogenesis of MGH is related to hormonal stimulation, emotional disorders, miRNA dysregulation, immune imbalance, abnormal activation of the WNT signaling pathway, and other factors [76–79]. Although endocrine therapy is the main non-surgical measure, hormonal regulation, such as with tamoxifen and bromocriptine, is currently the main WM program for the treatment of breast hyperplasia. However, these drugs have many complications, and prolonged use can lead to endocrine and metabolic disorders, which are unsafe for patients [2,80]. Acupuncture is a safe and effective alternative treatment for MGH. Researchers have found that acupuncture effectively improves the symptoms and quality of life of patients with MGH [81,82]. The effect of acupuncture on MGH has been clinically verified [19,20,83], and the choice of the best therapy has become the focus of current research.

4.2. Study findings

This study included 48 RCTs involving 4,500 women with MGH. This study aimed to evaluate the effects of various acupuncture methods on the efficacy (remission rate), estradiol and progesterone levels, breast lump size, and VAS scores of patients with MGH. The main outcomes were as follows: (1) In terms of effectiveness, WA (94.6%) was the best choice according to the SUCRA ranking; according to the NMA results, WA was superior to WM, TCM, and moxibustion. (2) In terms of lowering progesterone levels, BP was the most effective (85.7%) according to the SUCRA results and was superior to scraping and WM according to NMA results. (3) In terms of lowering estradiol levels, BP was the most effective (98.3%) according to the SUCRA results, and was superior to AHP, MA + TCM + WM, MA, EA + BP, EA, scraping, TCM, and WM, according to the NMA results. The secondary outcomes were as follows: (1) MA + TCM was the most effective (74.5%) in improving the size of the breast lump; according to the NMA results, MA + TCM was superior to WM and TCM. (2) In terms of improving the VAS score, WA was the most effective in improving the VAS score (69.8%) and was superior to BP according to the NMA results. The above results show that although the efficacy of different indicators varied, WA and BP ranked first among several indicators, and the combination of SUCRA and NMA comprehensive analysis and multidimensional efficacy analysis showed that WA and BP had outstanding efficacy in treating MGH.

Considering the moderate quality of the included studies, it is necessary to make a rational selection based on the characteristics of the patients' conditions in clinical practice. In addition, studies have shown that warm needle acupuncture can activate the mechanosensitive channel TRPV2, release mast cells, and produce analgesic effects. Studies have shown that warm needle acupuncture can regulate inflammatory factors and activate and regulate the signaling pathways of microglia and cell survival, thus improving symptoms [84,85]. Therefore, warm needle acupuncture for MGH may have anti-inflammatory effects near the acupoints and meridians. Bloodletting pricking therapy may exert anti-inflammatory effects by upregulating local anti-inflammatory factors (IL-4 and IL-10). Research also found that modulation of IL-10 gene expression through epigenetic modification of DNA methylation may be one of the key mechanisms underlying the anti-inflammatory effects of blood-stabbing therapy [86]. Studies have reported that bloodletting pricking therapy can activate the TLR4/IL-1 signaling pathway, modulate the immune response in patients with MGH, reduce inflammatory cell infiltration, and improve local tissue necrosis [87]. The mechanism of bloodletting pricking therapy in MGH

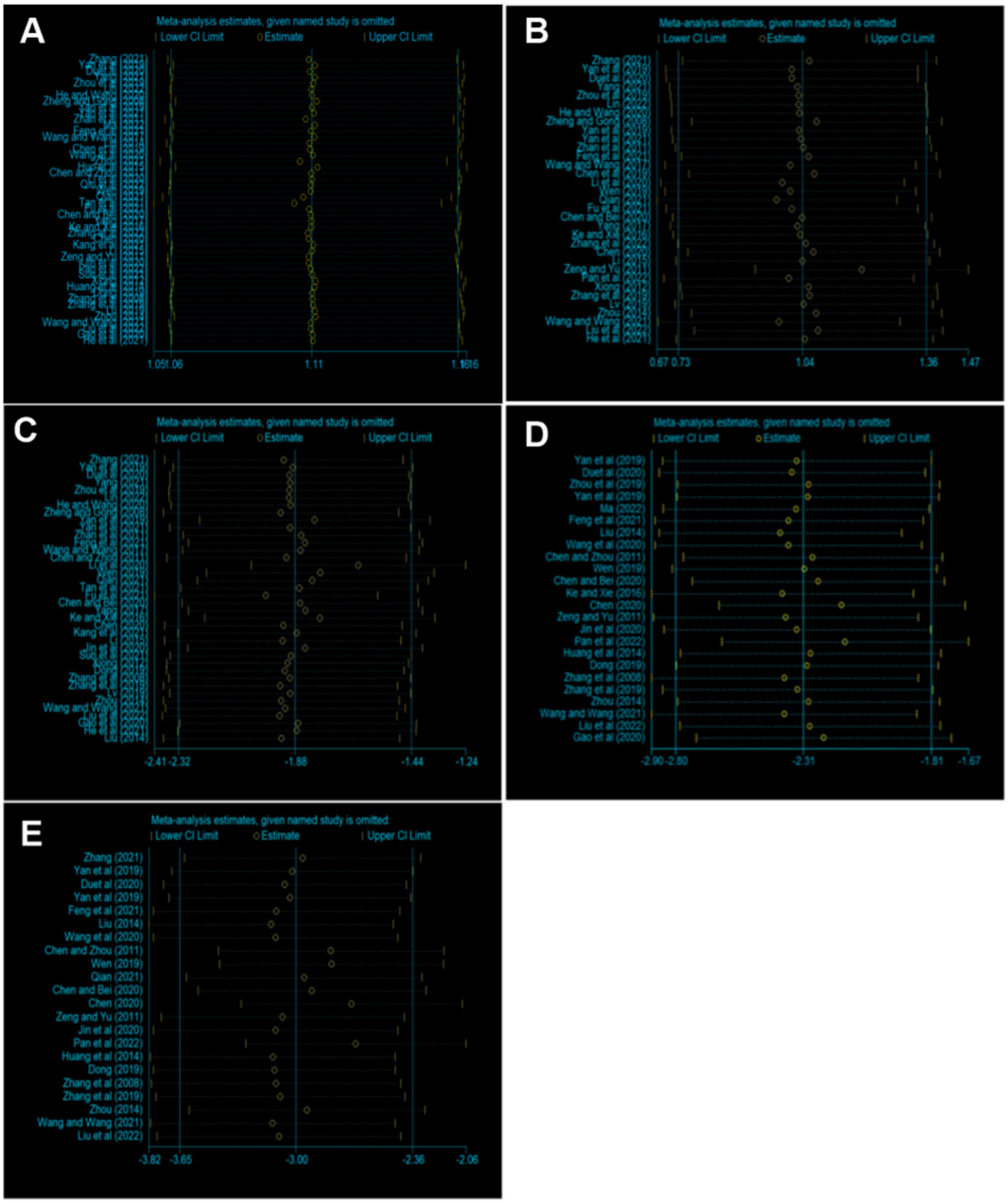

Fig. 10. Sensitivity analysis
(A) Effectiveness, (B) Progesterone, (C) Estradiol, (D) Breast lump size, (E) VAS score.

includes the targeted release of excess blood and stimulation of neurological reflex signals, which improve mammary blood circulation, promote mammary tissue metabolism, regulate the level of endocrine secretion, and promote anti-inflammatory processes.

4.3. Acupoint analysis

Further exploration of the selection and pairing of acupuncture points will help to propose better clinical treatment options for the complex symptoms of MGH. Most of these acupoints are located in the chest, abdomen, or lower limbs. We found that GB21 was the most commonly used. GB21 is an empirical point for the MGH. Modern anatomical studies have shown the following: (i) the site of MGH-induced pain is the anterior thoracic area, (ii) the somatic nerve centers that innervate the breast are C3–C4 and the cutaneous branch of the intercostal nerve, and (iii) the nerve that innervates GB21 originates from the same region. Therefore, stimulation of GB21 can reflexively promote the regulation of breast-related nerves through this pathway [88]. We found that PC6-KI3, PC6-GB21,

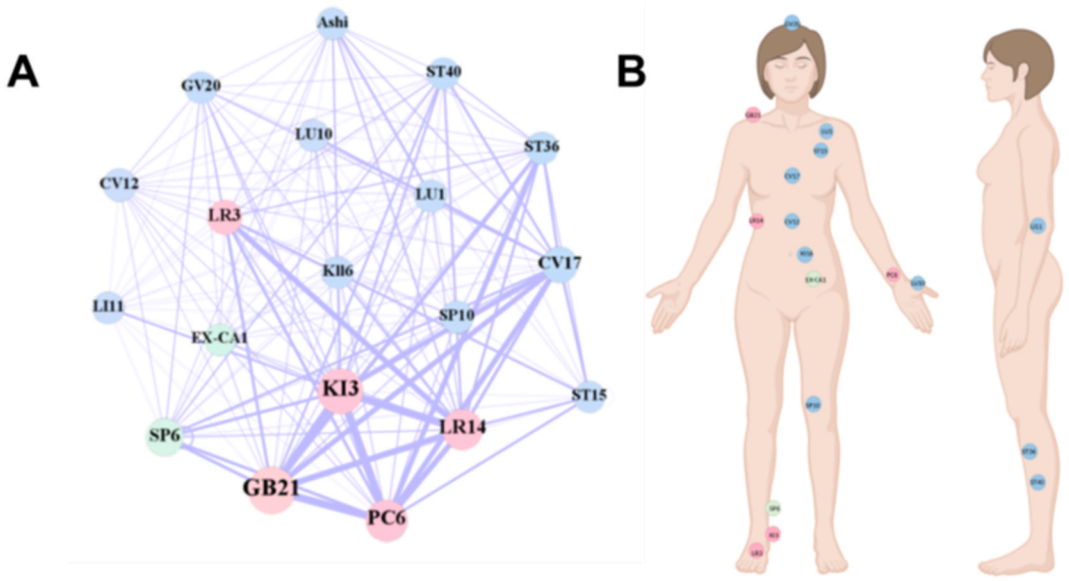

Fig. 11. Network of acupoints used to treat MGH in randomized clinical trials
(A) The Fruchterman–Reingold algorithm is used to display the three clusters that are found using network analysis in Gephi (version 0.9.2). Nodes with weighted degrees greater than two are shown. The weighted degree is used to weigh the node size, while the edge weight is used to weigh the line width. (B) The nodes are displayed on a human body template. The majority of Cluster 1 is located on the chest, abdomen, and lower leg (blue cluster). The shoulders, abdomen, wrist area, and foot area are where the acupoints in Cluster 2 are located (pink cluster). The abdomen and inner lower leg are where the acupoints in Cluster 3 are located (green cluster). GB21, the acupoint with the greatest weighted degree in Cluster 1, is located on the shoulder. This figure is created using BioRender.com. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

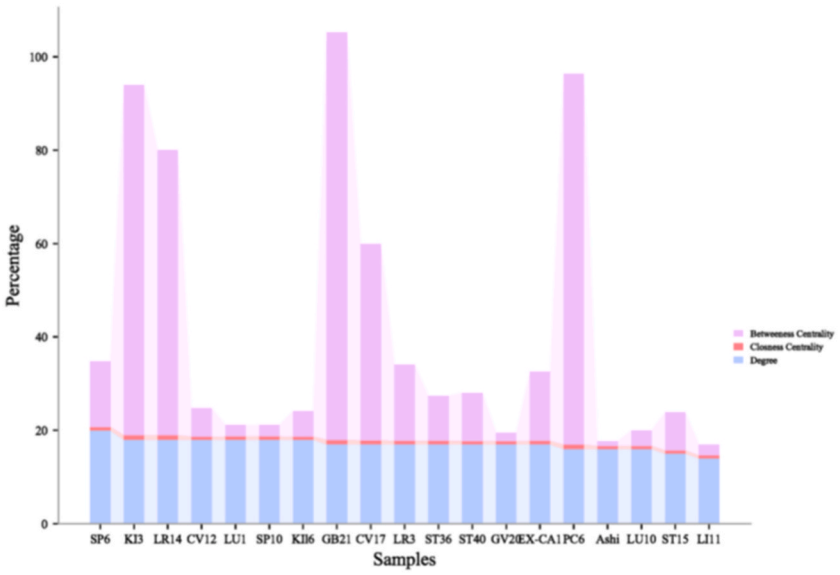

Fig. 12. Histogram of core acupoint analysis in the acupuncture treatment of MGH.

and PC6-LR14 were the most used acupoints and that these combinations contained PC6. Studies have shown that PC6 regulates the balance between sympathetic and vagal nerves and improves the gene profile of tissue energy metabolism, immune regulation, and inflammatory pathways by regulating adenosine A1 and A2b receptors, thus improving analgesic and inflammatory effects [89]. Stimulation of acupoints such as PC6, KI3, GB21, and LR14 can regulate neurohormones through the hypothalamic-pituitary-adrenal axis in both directions, regulate tissue metabolism and the endocrine system, inhibit the level of angiogenic factors, increase capillary permeability, promote blood circulation, and improve breast tissue metabolism, thus relieving pain, swelling, hardness, and other

discomforts in the mammary gland [90,91]. These findings provide significant clinical evidence for the effectiveness of MGH treatment.

4.4. Strengths

This study has several strengths. First, more RCTs were included in this study than in previously published meta-analyses [22,23]. Second, a comprehensive search of several key databases was conducted without language restrictions, and the sample size was large and representative. Third, patients with MGH can benefit from acupuncture with the development of a registration system for acupuncturists and the increasing promotion of acupuncture services worldwide. Acupuncture has been investigated as a potential monotherapy and drug combination therapy for patients with MGH, according to the current expert consensus developed by the World Society of TCM. However, the guide cited only a few studies on the use of acupuncture [25]. Furthermore, evidence from Chinese databases was largely omitted from the guidelines, although acupuncture experiments have been primarily conducted and published in China. In this study, the efficacy of RCTs from Chinese databases published in recent years was rigorously analyzed and evaluated, providing important evidence-based data for the future clinical management of MGH.

4.5. Limitations

However, this study has several limitations. First, the quality of the included studies varied, increasing the risk of bias, especially in areas of blinding, concealment of allocation, and selective outcome reporting, which may have led to exaggerated effects of treatments related to acupuncture. Future trials to improve the quality of evidence should follow the CONSORT guidelines [92] and the STRICTA checklist [93] and ensure methodological transparency. Second, baseline imbalances still exist due to the different clinical characteristics reported in these studies, leading to greater heterogeneity in the literature. Third, in terms of outcome selection, although patient-reported efficacy can be used as an endpoint, this dichotomous assessment was insufficient. Future studies should report more objective and specific subject-centered outcome indicators, including individual symptoms assessments, disease-specific quality of life questionnaires, and other relevant scales and ratings. Furthermore, acupuncture and related therapies should have a follow-up period of at least 12 weeks. Fourth, we were unable to evaluate the safety of each therapy due to the lack of standardization in reporting adverse events. Future researchers in this field should closely monitor and report the results appropriately.

5. Conclusions

This study had rigorous inclusion criteria, comprehensive outcome indicators, and systematic methodology and is expected to serve as a guideline to select acupuncture treatment for MGH. In summary, NMA indicated that qualified acupuncture treatment was more effective than simple drug treatment in patients with MGH. Among the acupuncture therapies examined, warm needle acupuncture and bloodletting pricking could be the best potential treatments. The acupuncture treatment included 19 core acupoints: GB21, PC6, ST15, EX-CA1, KI3, LR14, CV17, ST36, SP10, KI16, LR3, SP6, LI11, GV20, ST40, LU1, CV12, LU10, and Ashi. However, high-quality, large-sample, multicenter RCTs are required to confirm our conclusions.

Data availability statement

The original contributions presented in the study are included in the article and Supplementary Material. Further inquiries can be directed at the corresponding authors.

CRediT authorship contribution statement

Zhe He: Writing – original draft. **Liwei Xing:** Data curation. **Ming He:** Data curation. **Yuhuan Sun:** Data curation. **Jinlong Xu:** Data curation. **Haina Zhuang:** Data curation. **Rui Guo:** Data curation. **Hongxi Chen:** Data curation. **Kenan Wu:** Data curation. **Qinzuo Dong:** Data curation. **Guochen Yin:** Data curation. **Junbao Zhang:** Data curation. **Shun Yu:** Data curation. **Xiaoyan Wang:** Data curation. **Rong Zhao:** Data curation. **Dongdong Qin:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e28831.

Abbreviations List

MGH	mammary gland hyperplasia
NMA	network meta-analysis
ACE	acupoint catgut embedding
AHP	acupoint herbal patching
BC	bloodletting and cupping
BP	bloodletting pricking
CI	confidence interval
MA	manual acupuncture
MD	mean difference
OR	odds ratio
RCT	randomized controlled trial
SUCRA	surface under the cumulative ranking curve
TCM	traditional Chinese medicine
VAS	visual analog scale
WA	warm needle acupuncture
WM	Western medicine
GB21	Jianjing
PC6	Neiguan
ST15	Wuyi
EX-CA1	Zigong
KI3	Taixi
LR14	Qimen
CV17	Danzhong
ST36	Zusanli
SP10	Xuehai
KI16	Huangshu
LR3	Taichong
SP6	Sanyinjiao
LI11	Quchi
GV20	Baihui
ST40	Fonglong
LU1	Zhongfu
CV12	Zhongwan
LU10	Yuji

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