

Acupuncture for oligospermia and asthenozoospermia

A systematic review and meta-analysis

Wen Jia, MD*¹, Chuan Wang, MD, Ying Yin, MM

Abstract

Background: Acupuncture is widely used for oligospermia and asthenozoospermia in China, but its effect is unclear. We aimed to determine the effectiveness and safety of acupuncture in treating oligospermia and asthenozoospermia.

Methods: An electronic search for randomized controlled trials evaluating acupuncture treatment in patients with oligospermia and asthenozoospermia published from database inception to October 2018 was conducted in PubMed, EMBASE, the Chinese Biomedical Literature Database, the Chinese Scientific Journal Database (VIP Database), the Wan-Fang Database, the China National Knowledge Infrastructure and the Cochrane Library. We established search terms related to 3 areas (oligospermia, asthenozoospermia, and acupuncture). Two authors independently screened all identified citations and extracted the data. The methodological quality of the included trials was assessed using the Cochrane criteria.

Results: Seven studies with a total of 527 subjects were screened according to inclusion and exclusion standards, and most of the studies had significant methodological weaknesses. Seven randomized controlled trials tested the effects of acupuncture compared with placebo acupuncture and conventional medications in patients with oligospermia and asthenozoospermia. The results of this study suggest that acupuncture alone has no clear superiority in improving sperm motility (standard mean difference [SMD]=1.13, 95% confidence interval [CI]: -0.64 to 2.89), the sperm concentration (SMD=0.32, 95% CI: 0.27-0.92) or semen volume compared with placebo acupuncture. No significant difference was found between acupuncture alone and conventional medications in improving sperm motility (SMD=-0.53, 95% CI: -2.54 to 1.48), the sperm concentration (SMD=-1.10, 95% CI: -1.48 to -0.72) or semen volume. However, adjuvant acupuncture may enhance the effect of medications on improving sperm motility (SMD=4.10, 95% CI: 1.09-7.12) and the sperm concentration (SMD=1.07, 95% CI: 0.739-1.40), but the study heterogeneity was too high to establish robust conclusions.

Conclusion: These results suggest that the current evidence does not support acupuncture as an effective treatment for oligospermia and asthenozoospermia; therefore, acupuncture is not currently recommended as a treatment for these conditions. However, owing to the high risk of bias among the included studies, the evidence is limited, and more large-scale, high-quality clinical trials are needed in the future.

Trial registration number: PROSPERO CRD42018083885

Abbreviations: CI = confidence interval, RCTs = randomized controlled trials, SMD = standard mean difference.

Keywords: acupuncture, asthenozoospermia, meta-analysis, oligospermia, randomized controlled trial, review

Editor: Maya Saranathan.

The authors have no funding and conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Acupuncture Department, Wuhan Municipal Hospital of Integrated Chinese Medicine and Western Medicine, Wuhan, Hubei, China.

* Correspondence: Wen Jia, Acupuncture Department, Wuhan Municipal Hospital of Integrated Chinese Medicine and Western Medicine, Wuhan 430022, Hubei, China (e-mail: 490595951@qq.com).

Copyright © 2021 the Author(s). Published by Wolters Kluwer Health, Inc.

This is an open access article distributed under the Creative Commons Attribution License 4.0 (CCBY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Jia W, Wang C, Yin Y. Acupuncture for oligospermia and asthenozoospermia: a systematic review and meta-analysis. *Medicine* 2021;100:48(e27816).

Received: 5 May 2020 / Received in final form: 21 October 2021 / Accepted: 29 October 2021

<http://dx.doi.org/10.1097/MD.00000000000027816>

1. Introduction

Because of harmful factors such as life pressures, worsening environments, and food contamination,^[1,2] the incidence of infertility has increased annually worldwide.^[3] Statistical results show that the infertility rate has reached 15% among people of childbearing age,^[3] with 50% of cases attributable to male infertility.^[4] Oligospermia and asthenozoospermia are common causes of male infertility. The World Health Organization defines oligospermia and asthenozoospermia as “a state of impaired sperm production and motility”.^[5] The main therapeutic strategy is drug treatment, including androgens, gonadotropins, corticosteroids, follicle-stimulating hormone, and antioxidants.^[6] Systematic reviews have shown that some treatments are effective, but others are not.^[7,8] China announced that the iconic one-child policy had finally been replaced by a universal two-child policy in 2015, resulting in a large birth demand among Chinese parents.^[9] However, the quality of sperm has been decreasing markedly in China.^[2] Meanwhile, a global decline in human sperm quality including low sperm production, inferior

morphology, and poor motility has been noted in recent decades,^[10] and the causes vary and are complex.^[11] To increase the probability of pregnancy, many people turn to complementary and alternative medicine therapies.^[12]

Acupuncture is an important component of complementary and alternative medicine,^[13] and some studies have suggested that acupuncture is a promising treatment for oligospermia and asthenozoospermia.^[14] A systematic review concluded that acupuncture might improve semen quality, but the evidence was insufficient because of the small number of studies.^[15] However, the review did not comprehensively search research papers in Chinese databases and used improper control groups (such as patients receiving Chinese herbal medicine and Chinese patent medicine), complicating objective evaluation of the clinical efficacy and safety of acupuncture in oligospermia and asthenozoospermia, and the previous review was also outdated; consequently, the effectiveness and safety of acupuncture for oligospermia and asthenozoospermia have not been verified. Despite limited high-quality evidence for the clinical efficacy of acupuncture in oligospermia and asthenozoospermia, acupuncture has been widely used in an attempt to reduce clinical symptoms and improve the quality of semen in China; therefore, the current research evidence must be summarized and analysed.

Therefore, the aim of this study was to assess the evidence from randomized controlled trials (RCTs) for acupuncture as a treatment method for patients with oligospermia and asthenozoospermia.

2. Methods

This is a systematic review, and ethical approval was not necessary. The protocol of this review was registered in the International Prospective Register of Systematic Reviews, and the trial registration number was CRD42018083885.

2.1. Literature search

We searched PubMed, EMBASE, the Chinese Biomedical Literature Database, the Chinese Scientific Journal Database (VIP Database), the Wan-Fang Database, the China National Knowledge Infrastructure and the Cochrane Library for relevant studies published prior to October 30, 2019. Studies published in Chinese or English languages were retrieved using a combination of keywords and subject terms. We established search terms related to 3 areas (oligospermia, asthenozoospermia, and acupuncture). The search strategy used in the PubMed database is shown in Table 1. We identified additional relevant articles by manually searching the references.

2.2. Study selection

We included all RCTs that used acupuncture for oligospermia and asthenozoospermia. The patients conformed to the diagnostic criteria established in the management guidelines for male infertility issued by the authoritative diagnostic organizations. Any types of acupuncture were included, including manual acupuncture, scalp acupuncture, auricular acupuncture, electro-puncture, three-edged needle acupuncture, warm acupuncture and dry needling. The control groups included patients receiving placebo acupuncture, no treatment controls, or patients receiving other conventional drugs, such as androgens, gonadotropins, corticosteroids, folliclestimulating hormone and antioxidants.

Table 1

Search strategy used in PubMed.

Number	Search items
1	Randomized controlled trial.pt
2	Randomized.ti,ab
3	Randomly.ti,ab
4	Groups.ti,ab
5	Trial.ti,ab
6	Or 1 to 5
7	Acupuncture.ti,ab
8	Electroacupuncture.ti,ab
9	Scalp acupuncture.ti,ab
10	Three edged needle.ti,ab
11	Fire needle.ti,ab
12	Auricular acupuncture.ti,ab
13	Dry needling.ti,ab
14	Warm acupuncture.ti,ab
15	Pyonex.ti,ab
16	Manual acupuncture.ti,ab
17	Or 7 to 16
18	Oligospermia.ti,ab
19	Low sperm count.ti,ab
20	Hypospermatogenesis.ti,ab
21	Hypospermatogeneses.ti,ab
22	Disc herniation-induced sciatica.ti,ab
23	Low sperm counts.ti,ab
24	Sperm count, low.ti,ab
25	Sperm counts, low.ti,ab
26	Oligoasthenoteratozoospermia.ti,ab
27	Oligoasthenoteratozoospermias.ti,ab
28	Oligozoospermia.ti,ab
29	Or 18 to 28
30	Asthenospermia.ti,ab
31	Astheno teratozoospermia.ti,ab
32	Astheno teratozoospermias.ti,ab
33	Teratozoospermia, astheno.ti,ab
34	Teratozoospermias, astheno.ti,ab
35	Asthenoteratozoospermia.ti,ab
36	Asthenoteratozoospermias.ti,ab
37	Or 30 to 36
38	6 and 17 and 29 and 37

Acupuncture with active medicine was also included if the medicine was also applied to the control group. The primary outcomes were the indicators of semen motility and sperm morphology). The secondary outcome was adverse events due to the treatments. We excluded the following studies: (1) non-RCTs; (2) duplicate studies; (3) studies lacking data integrity; (4) studies of acupuncture combined with Chinese medicine; and (5) studies without the information of interest.

2.3. Data extraction and management

Two investigators [Wen Jia and Chuan Wang] independently investigated the titles, abstracts and full texts of the papers identified through database searches to confirm that they contained eligible trials. The investigators extracted the data based on a standard data collection table. The main extracted information included the first author, publication year, country, age, gender, sample size, interventions, follow-up period, outcomes and adverse events. All disagreements were resolved by a third author [Ying Yin]. All retrieved studies were input into EndNote 7X (Thomson Reuters, New York, NY, USA) software to manage the data.

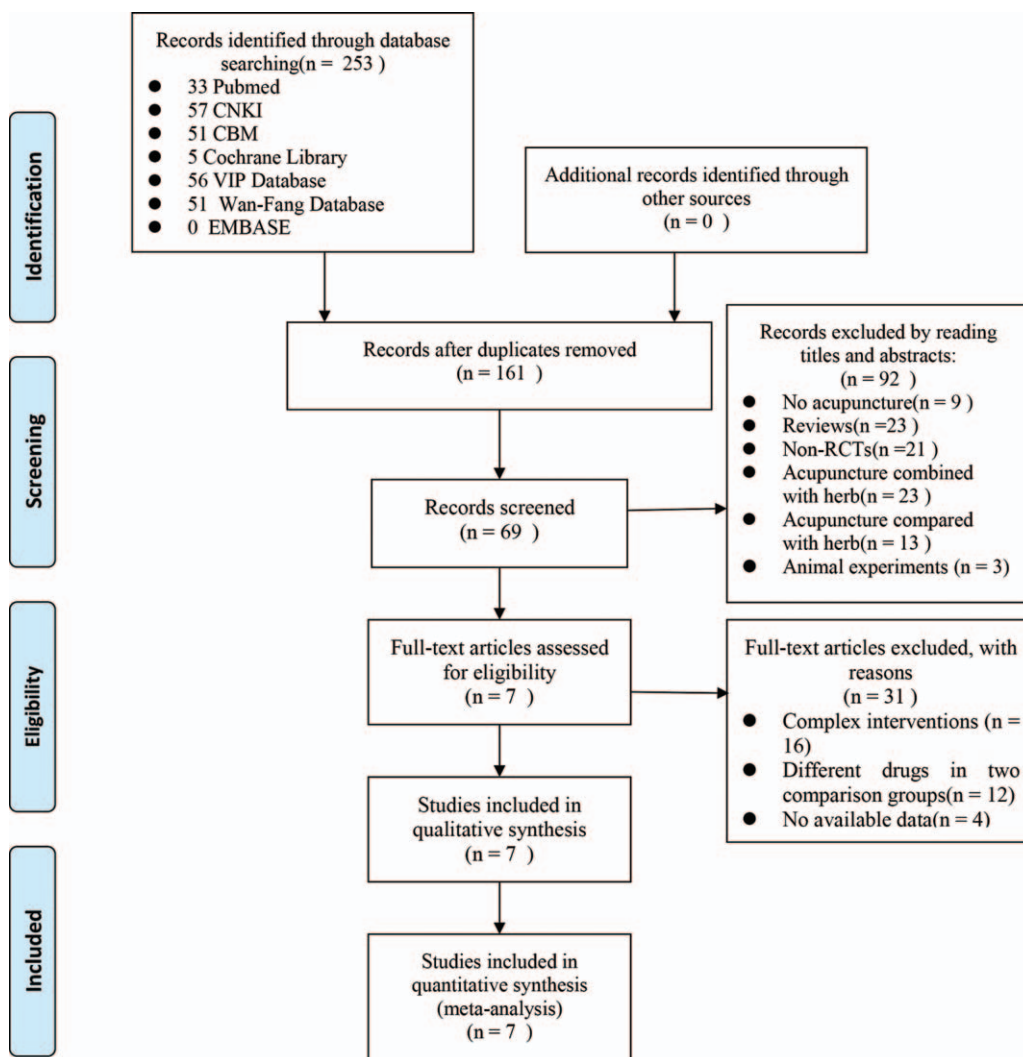


Figure 1. Flow chart of the trial selection process. RCT = randomized controlled trial.

2.4. Assessment of risk of bias

Two investigators [Wen Jia and Chuan Wang] independently evaluated the risk of bias in the included RCTs according to the Cochrane Collaborations tool.^[16] The following seven factors were evaluated: (1) random sequence generation; (2) allocation concealment; (3) blinding of the participants and personnel; (4) blinding of outcome assessment; (5) incomplete outcome data; (6) selective reporting; and (7) other bias. Each factor was categorized as low risk, high risk or unclear. Any disagreements were resolved by a third author [Ying Yin].

2.5. Statistical analysis

We conducted all statistical analyses with RevMan V.5.3.3 software. The indicators of semen quality were expressed as the standard mean difference (SMD) with 95% confidence intervals (CIs). We used a random-effects model or a fixed-effects model for the metaanalysis of the included studies based on the existence of heterogeneity between the study results. Heterogeneity was assessed using Cochrane’s Q test and I2 statistics.^[17] We used a funnel plot to assess publication bias when 10 or more trials were

included in a meta-analysis, and approximately symmetrical funnel plots were considered indicative of a low risk of bias.^[18]

3. Results

3.1. Study screening and characteristics of the included studies

A total of 253 records were identified from 7 electronic databases; after 122 duplicates were excluded, 131 records were considered for screening. A total of 92 irrelevant records were excluded after screening the titles and abstracts. Thirty-two records were excluded after the full-text screening. Finally, 7 RCTs involving 527 patients were eligible for inclusion.^[19–25] Figure 1 shows the flow chart of the study searches. The characteristics of the included studies are shown in Table 2.

3.2. Study description

All studies were published from 2003 to 2017; 5 trials were performed in China,^[21–25] 1 was performed in Brazil^[19] and 1 was performed in Germany.^[20] Five studies were two-arm trials,^[19–23] and 2 were three-arm trials.^[24,25]

Table 2**Characteristics of the included studies on acupuncture for oligospermia and asthenozoospermia.**

Study (yr)	Sample (n): age	Duration of disease	Experimental group	Control group	Treatment (T) Follow-up (F)	Outcome measurements	Adverse Events (n)
Gurfinkel et al (2003) ^[19]	E (8): mean 33.4 yr C (10): mean 31.6 yr	E: median 7.6 yr C: median 6.1 yr	Manual acupuncture and moxa	Placebo acupuncture	T: 10 wk F: NR	Percentage of normal-form sperm	NR
Dieterle et al (2010) ^[20]	E (24): NR C (28):NR	NR	Manual acupuncture	Placebo acupuncture	T: 6 wk F: 2 mo	1.Sperm motility 2.Sperm concentration 3.Semen volume	No adverse events
Zhang et al (2016) ^[21]	E (30): 31.68 ± 1.85 yr C (30):32.15 ± 1.45 yr	E: 2.45 ± 1.25 yr C: 2.35 ± 1.46 yr	Fire needle and manual acupuncture	Clomiphene	T: 12 wk F:NR	Sperm motility	NR
Sun et al (2016) ^[22]	E (42): 32 ± 3 yr C (40): 31 ± 3 yr	E: 6.4 ± 0.5 yr C: 6.3 ± 0.3 yr	Manual acupuncture	Placebo acupuncture	T: 12 wk F:NR	1.Sperm motility 2.Sperm concentration	NR
Wang et al (2016) ^[23]	E (37): 26.38 ± 3.54 yr C (38): 26.16 ± 3.16 yr	E: 35.62 ± 5.61 mo C: 34.84 ± 4.65 mo	Manual acupuncture	Vitamin E and vitamin C	T: 3 mo F: NR	1.Sperm motility 2.Sperm concentration	E: 1 case with fainting during acupuncture C: 0
Li et al (2017) ^[24]	E1 (40): 30.43 ± 3.27 yr E2 (40): 32.14 ± 3.37 yr C (40): 29.95 ± 3.32 yr	E1: 4.66 ± 1.97 yr E2: 4.75 ± 2.35 yr C: 5.05 ± 2.63 yr	E1 Tamoxifen+ TEAS E2 TEAS	Tamoxifen	T: 8 wk F: NR	1. Sperm motility 2.Sperm concentration	NR
Liu et al (2017) ^[25]	E1 (40): NR E2 (40): NR C (40): NR	NR	E1 L-carnionc+ moxa E2 Moxa	L-carnionc	T: 3 mo F:NR	1.Sperm motility 2.Sperm concentration 3.Semen volume	NR

E = experimental group, C = control group, NR = no report, TENS = transcutaneous electrical acupoint stimulation.

3.2.1. Patients. Seven studies involving 527 patients were included, and all of the participants were included in the statistical analysis.

3.2.2. Acupuncture intervention. All treatment protocols were based on traditional Chinese medicine theory and the clinical experience of the acupuncturists. Three trials used manual acupuncture alone,^[20,22,23] 1 trial used the combination of manual acupuncture and moxa,^[19] 1 trial used the combination of manual acupuncture and fire needle,^[21] 1 trial used the combination of transcutaneous electrical acupoint stimulation and tamoxifen,^[24] and another trial used the combination of moxa and L-carnitine.^[25] The acupoints for each trial are shown in Table 3.

3.2.3. Control interventions. Three studies compared acupuncture to placebo acupuncture,^[19,20,22] and 4 studies compared acupuncture to conventional medications (including clomiphene, vitamin E, vitamin C, tamoxifen, and L-carnitine).^[21,23–25]

3.2.4. Outcome measures. All studies evaluated semen samples according to the World Health Organization standard.^[5] Six studies measured sperm motility,^[20–25] 5 studies measured sperm concentration,^[20,22–25] 2 studies measured semen volume,^[19,24] and 1 study measured the percentage of normal-form sperm.^[19]

3.2.5. Risk of bias within studies. All of the studies mentioned randomization, but only 3 studies reported adequate sequence generation,^[20,23,24] 2 studies used the random number table,^[23,24] and 1 used a computer-based random number generator.^[20] One study reported details about allocation concealment, which ensured that all patients and study personnel were blinded to group assignment for the duration of the study.^[20] Because of the nature of acupuncture, acupuncturists cannot be blinded, but 3 studies used placebo acupuncture as a control intervention that ensured blinding of the patients.^[19,20,22] No studies reported blinding of outcome assessors. Five studies reported dropouts without providing any reasons.^[19–23] Details on the risk of bias are shown in Figure 2.

Table 3**Selected acupoints of each study.**

Study (year)	Acupoints
Gurfinkel et al(2003) ^[19]	Qichong (ST 30), Taixi (KI 3), Zusanli (ST 36), Hegu (LI 4), Sanyinjiao (SP 6), Gongsun (SP 4), Taichong (LR 3), Neiguan (PE 6)
Dieterle et al(2010) ^[20]	Zusanli (ST 36), Sanyinjiao (SP 6), Taixi (KI 3), Taichong (LR 3), Shenshu (BL 23), Ciliao (BL 32), Guilai (ST 29), Xuehai (SP 10), Guanyuan (RN 4), Baihui (DU 20)
Zhang et al (2016) ^[21]	Shenshu (BL 23), Zusanli (ST 36), Taixi (KI 3), Taichong (LR 3), Baihui (DU 20)
Sun et al (2016) ^[22]	Guanyuan (RN 4), Qihai (RN 6), Baihui (DU 20), Zusanli (ST 36), Yinlinquan (SP 9), Sanyinjiao (SP 6)
Wang et al (2016) ^[23]	Guanyuan (RN 4), Qihai (RN 6), Sanyinjiao (SP 6), Zusanli (ST 36), Fenglong (ST 40), Shenshu (BL 23), Mingmen (DU 4), Taixi (KI 3), Ciliao (BL 32)
Li et al (2017) ^[24]	Guanyuan (RN 4), Sanyinjiao (SP 6), Zusanli (ST 36), Shenshu (BL 23), Yongquan(KI 1)
Liu et al (2017) ^[25]	Dazhui (DU 14), Taodao (DU 13), Shenzhu (DU 12), Shendao (DU 11), Lingtai (DU 10), Zhiyang (DU 9), Jinsuo (DU 8), Zhongshu (DU 7), Jizhong(DU 6), Xuanshu (DU 5), Mingmen (DU 4), Yaoyangguan (DU 3)

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Dieterle S 2010	+	+	-	?	-	+	?
Gurfinkel 2003	?	?	-	?	-	+	?
Li 2017	+	?	-	?	+	+	?
Liu 2017	?	?	-	?	+	+	?
Sun 2016	?	?	-	?	-	+	?
Wang 2016	+	?	-	?	-	+	?
Zhang 2016	?	?	-	?	-	+	?

Figure 2. Summary of the risk of bias of the included trials.

3.3. Effects of acupuncture

3.3.1. Acupuncture versus placebo acupuncture

3.3.1.1. Sperm motility (%). Two studies involving 134 participants reported sperm motility.^[20,22] The meta-analysis of the 2 studies showed no significant differences between the acupuncture group and the placebo acupuncture group (standard mean difference [SMD]=1.13, 95% confidence interval [CI]: -0.64 to 2.89), but the heterogeneity ($I^2=95%$, $P<.0001$) was high (Fig. 3).

3.3.1.2. Sperm concentration (million/mL). Two studies involving 134 participants reported sperm concentration.^[20,22] A meta-analysis of the 2 studies showed no significant differences between the acupuncture group and the placebo acupuncture group (SMD=0.32, 95% CI: -0.27 to 0.92), but the heterogeneity ($I^2=65%$, $P=.09$) was high (Fig. 4).

3.3.1.3. Semen volume (mL). Only 1 study involving 52 participants found no difference in semen volume between acupuncture and placebo acupuncture (3.7 ± 1.4 versus 3.8 ± 1.6).^[20]

3.3.1.4. Percentage of normal-form sperm (%). Only 1 study involving 18 participants found that manual acupuncture and moxa were more effective than placebo acupuncture in improving the percentage of normal-form sperm (60.00 ± 22.04 versus 35.38 ± 28.78).^[19]

3.3.2. Acupuncture versus drugs

3.3.2.1. Sperm motility (%). Four studies involving 295 participants reported no significant difference between acupuncture and conventional medications in improving sperm motility (SMD=-0.53, 95% CI: -2.54 to 1.48); however, the heterogeneity ($I^2=98%$, $P<.0001$) was high (Fig. 5).^[21,23-25]

3.3.2.2. Sperm concentration (million/mL). Three studies involving 235 participants reported that the conventional medicine group had a significant difference in sperm concentration compared to the acupuncture group (SMD=-1.10, 95% CI:

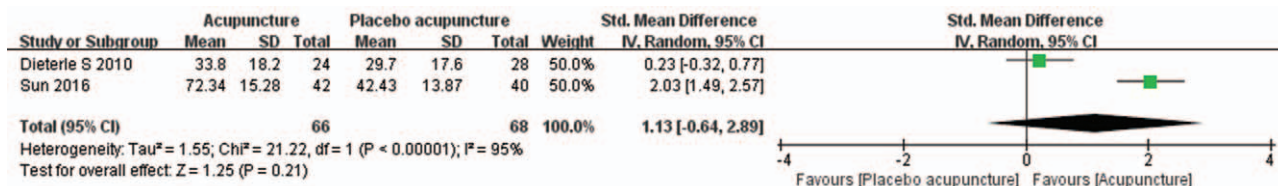


Figure 3. Meta-analysis of the sperm motility of the acupuncture versus placebo acupuncture. CI = confidence interval, SD = standard deviation.

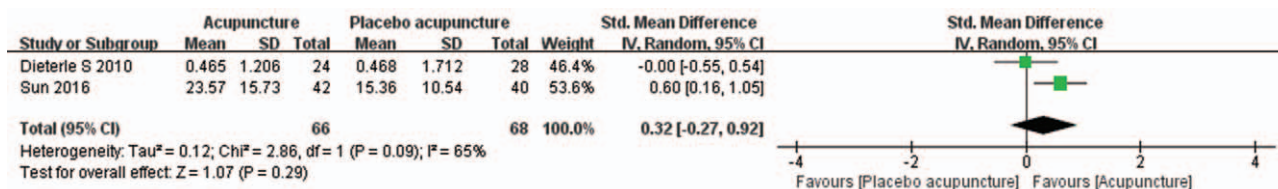


Figure 4. Meta-analysis of the sperm concentration of the acupuncture versus placebo acupuncture. CI = confidence interval, SD = standard deviation.

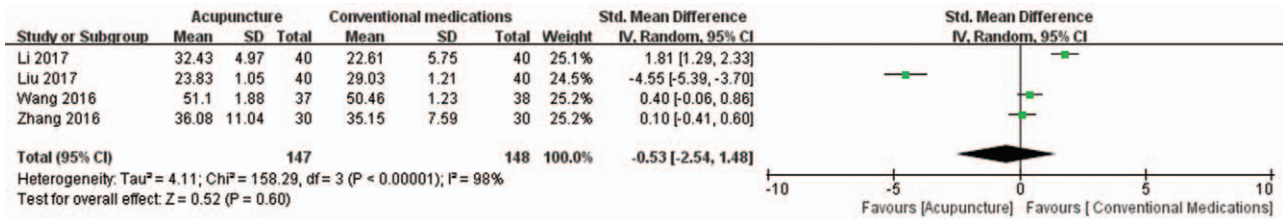


Figure 5. Meta-analysis of the sperm motility of the acupuncture versus drugs. CI = confidence interval, SD = standard deviation.

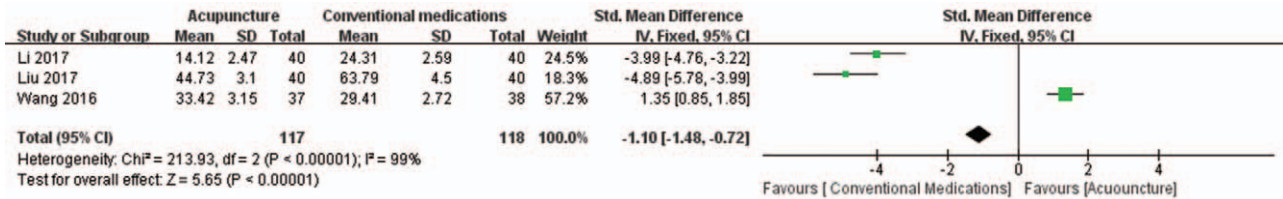


Figure 6. Meta-analysis of the sperm concentration of the acupuncture versus drugs. CI = confidence interval, SD = standard deviation.

-1.48 to -0.72), but the heterogeneity ($I^2 = 99\%$, $P < .0001$) was high (Fig. 6).^[23-25]

3.3.2.3. Semen volume (mL). Only the 1 study involving 80 participants found that moxa was more effective than L-carnitine in increasing the semen volume (4.02 ± 0.24 versus 3.26 ± 0.36).^[25]

3.3.3. Acupuncture plus conventional medication versus the same conventional medication

3.3.3.1. Sperm motility (%). Two studies involving 160 participants found that acupuncture plus conventional medication was significantly more effective than conventional medication alone in improving sperm motility (SMD = 4.10, 95% CI: 1.09–7.12), but the heterogeneity ($I^2 = 96\%$, $P < .0001$) was high (Fig. 7).^[24,25]

3.3.3.2. Sperm concentration (million/mL). Two studies involving 160 participants found that acupuncture plus conventional medication was significantly more effective than conventional medication alone in improving the sperm concentration (SMD = 1.07, 95% CI: 0.739–1.40), and the heterogeneity ($I^2 = 27\%$, $P = .24$) was low (Fig. 8).^[24,25]

3.3.3.3. Semen volume (mL). Only 1 study involving 80 participants found no difference in semen volume between moxa plus L-carnitine and L-carnitine alone (3.23 ± 0.28 versus 3.26 ± 0.36).^[25]

3.4. Adverse events

In 1 trial, 1 case of fainting during acupuncture was reported.^[23] In another trial, all patients had no adverse events during

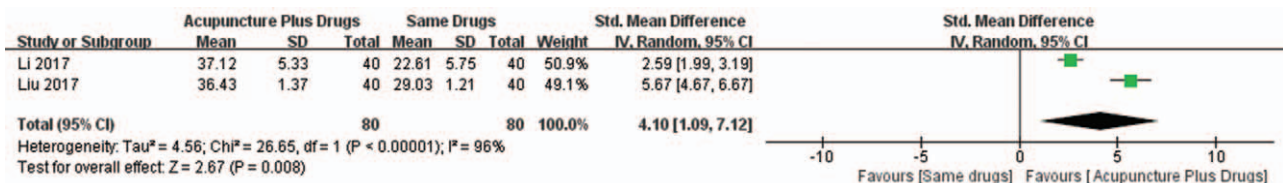


Figure 7. Meta-analysis of the sperm motility of the acupuncture plus drugs versus the same drugs. CI = confidence interval, SD = standard deviation.

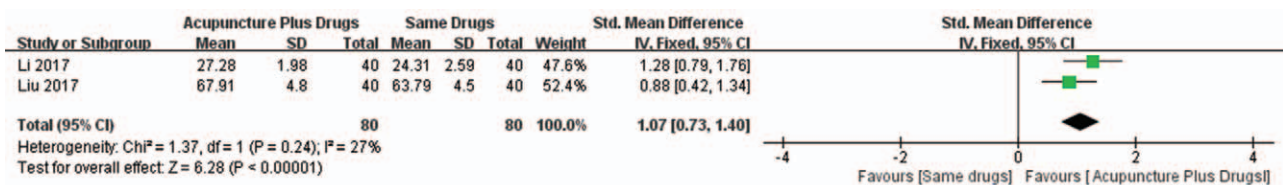


Figure 8. Meta-analysis of the sperm concentration of the acupuncture plus drugs versus the same drugs. CI = confidence interval, SD = standard deviation.

treatment.^[19] Five trials did not report whether adverse events occurred during treatment.^[19,21,22,24,25]

4. Discussion

This systematic review included 7 RCTs involving 527 patients. Five kinds of acupuncture were identified in the treatment of oligospermia and asthenozoospermia, including manual acupuncture, moxa, manual acupuncture plus fire needle, manual acupuncture plus moxa, and transcutaneous electrical acupoint stimulation. The results of the meta-analysis showed no difference in semen quality improvements between acupuncture alone and placebo acupuncture or conventional medications. Acupuncture plus conventional medications may be more effective than conventional medication alone in improving semen quality, but the methodological quality of the included studies was very low, and the heterogeneity was high; thus, the current evidence was insufficient to draw definitive conclusions.

Some observational studies have suggested that acupuncture might have an effect on male infertility,^[26] and some nonrandomized control studies found that the sperm concentrations and the percentage of ultramorphologically normal sperm were significantly higher after acupuncture compared with the waiting list group.^[14,27] Acar et al^[28] suggested that acupuncture might improve testicular perfusion by stimulating the nerve. Siterman et al^[29] suggested that acupuncture might reduce genital inflammatory reactions by enhancing immune responses. However, the mechanism of acupuncture related to sperm quality is not clear.

In this systematic review, only 7 studies were included in the statistical analysis. Three studies reported no significant differences between acupuncture and placebo acupuncture in improving sperm motility (SMD=1.13, 95% CI: -0.64 to 2.89),^[20,22] the sperm concentration (SMD=0.32, 95% CI: -0.27 to 0.92),^[20,22] or semen volume (3.7±1.4 versus 3.8±1.6).^[20] Four studies found no significant difference between acupuncture and conventional medication in improving sperm motility (SMD=-0.53, 95% CI: -2.54 to 1.48),^[21,23-25] while 3 studies reported that conventional medication might be more effective than acupuncture in improving the sperm concentration (SMD=-1.10, 95% CI: -1.48 to -0.72).^[23-25] Therefore, the current evidence does not support acupuncture as an effective treatment for oligospermia and asthenozoospermia, which differs from the result of a previous systematic review.^[15] The main reason for this phenomenon is that the previous systematic review included RCTs that applied acupuncture plus an herbal mixture for oligospermia and asthenozoospermia and used the same herbal mixture as the control groups; however, the herbal mixture was not recommended for the treatment of oligospermia and asthenozoospermia by the clinical practice guidelines on infertility. Therefore, the research design of the previous review was not appropriate, and the results of that review were not objective.

Two studies found that acupuncture plus conventional medication was significantly more effective than conventional medication alone in improving sperm motility (SMD=4.10, 95% CI: 1.09-7.12),^[24,25] which seems to imply that acupuncture can help to enhance the effects of conventional drugs, but the heterogeneity among these studies was too high to make robust conclusions. The only statistically significant improvement with a low level of heterogeneity ($P=.24$) seems to be the semen concentration (SMD=1.07, 95% CI: 0.739-1.40),^[24,25] and the

result is same as the result of the previous study,^[27] reflecting that acupuncture may have potential therapeutic value in sperm disorders. However, because of high statistical heterogeneity in other results, this does not support acupuncture as an effective treatment for oligospermia and asthenozoospermia.

One trial reported 1 case of fainting during acupuncture,^[23] and another trial reported that all patients had no adverse events during treatment.^[20] However, most trials did not report whether adverse events occurred during treatment; thus, whether acupuncture is a safe treatment for oligospermia and asthenozoospermia is uncertain.

The quality of the included trials was low, and the lack of blinding and randomization increased the selection bias and performance bias. Incomplete information and an unreasonable loss of patients led to a confounding bias in these results. Small sample sizes complicated determination of firm conclusions regarding the study outcomes, and the results of this study may change as more trials are conducted.

5. Conclusion

The results of this study suggest that acupuncture alone has no clear superiority in improving sperm quality compared with conventional medications or placebo acupuncture, so acupuncture is not recommended for improving the sperm quality and count of healthy individuals. Adjuvant acupuncture may enhance the effect of conventional medications, but the study heterogeneity was too high to make robust conclusions. The current evidence does not support acupuncture as an effective treatment for oligospermia and asthenozoospermia, more large-scale, high-quality clinical trials will be needed in the future.

Author contributions

Wen Jia and Ying Yin conceived the study. Wen Jia and Chuan Wang reviewed studies for inclusion, assessed the included studies, extracted data, completed the first draft and edited the review. Ying Yin arbitrated in cases of disagreement and ensured the absence of errors. All authors approved the final manuscript.

Data curation: Chuan Wang.

Writing – original draft: Wen Jia, Chuan Wang.

Writing – review & editing: Wen Jia, Ying Yin.

References

- [1] Lafuente R, García-Blázquez N, Jacquemin B, et al. Outdoor air pollution and sperm quality. *Fertil Steril* 2016;106:880-96.
- [2] Liu Y, Ding Z. Obesity a serious etiologic factor for male subfertility in modern society. *Reproduction* 2017;154:123-31.
- [3] Boivin J, Bunting L, Collins JA, et al. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Hum Reprod* 2007;22:1506-12.
- [4] Hirsh A. Male subfertility. *BMJ* 2003;327:669-72.
- [5] Niederberger C. WHO manual for the standardized investigation, diagnosis and management of the infertile male. *Urology* 2001;57:208.
- [6] Shichao C. Clinical practice guidelines on infertility: a systematic review. *Chin J Evid Based Med* 2013;13:947-54.
- [7] Irvine S. Guidelines in the treatment of male infertility. *Int Congress* 2004;1226:202-7.
- [8] Ross C, Morriss A, Khairy M, et al. A systematic review of the effect of oral antioxidants on male infertility. *Reprod Biomed Online* 2010;20:711-23.
- [9] Zeng Y, Hesketh T. The effects of China's universal two-child policy. *Lancet* 2016;388:1930-8.
- [10] Rolland M, LeMoal J, Wagner V, et al. Decline in semen concentration and morphology in a sample of 26,609 men close to general population between 1989 and 2005 in France. *Hum Reprod* 2013;28:462-70.

- [11] Serwaa D, Bello FA, Osungbade KO, et al. Prevalence and determinant of erectile dysfunction in type II diabetes mellitus and healthy men. *SciMed J* 2021;1:2704–33.
- [12] O'Reilly E, Sevigny M, Sabarre KA, et al. Perspectives of complementary and alternative medicine (CAM) practitioners in the support and treatment of infertility. *BMC Complement Altern Med* 2014;14:1–8.
- [13] Bodeker G, Kronenberg FA. Public health agenda for traditional, complementary, and alternative medicine. *Am J Public Health* 2002;92:1582–91.
- [14] Siterman S, Eltes F, Wolfson V, et al. Does acupuncture treatment affect sperm density in males with very low sperm count? A pilot study. *Andrologia* 2000;32:31.
- [15] Jerng UM, Jo JY, Lee S, et al. The effectiveness and safety of acupuncture for poor semen quality in infertile males: a systematic review and meta-analysis. *Asian J Androl* 2014;16:884–91.
- [16] Higgins JPT, Altman DG, Gotzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:5928.
- [17] Jackson D, White IR, Riley RD. Quantifying the impact of between-study heterogeneity in multivariate meta-analyses. *Stat Med* 2012;31:3805–20.
- [18] Egger M, Davey Smith G, Schneider M, et al. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 1997;315:629–34.
- [19] Gurfinkel E, Cedenho AP, Yamamura Y, et al. Effects of acupuncture and moxa treatment in patients with semen abnormalities. *Asian J Androl* 2003;5:345–8.
- [20] Dieterle S, Li C, Greb R, et al. A prospective randomized placebo-controlled study of the effect of acupuncture in infertile patients with severe oligoasthenozoospermia. *Fertil Steril* 2010;92:1340–3.
- [21] Zhang ZS, Qiao YJ. Treatment of 30 cases of kidney-yang deficiency and weak sperm disease with a fire needle combined with manual acupuncture. *J Extern Ther TCM* 2016;25:42–3.
- [22] Sun YM, Li SD, Li Y. Clinical observation on acupuncture treatment of oligospermia. *Shanghai J Acupunct Moxibust* 2016;35:691–3.
- [23] Wang WY, Ni LW, Geng Q. The clinical effect of acupuncture and moxibustion on oligospermia and asthenospermia and the effect of oxidative stress injury. *Lishizhen Medi Mater Med Res* 2016;127:886–7.
- [24] Li T, Xie S, Tan Y, et al. Mid-frequency transcutaneous electrical acupoint stimulation combined with tamoxifen for the treatment of oligoasthenozoospermia. *Natl J Androl Zhonghua Nan Ke Xue Za Zhi* 2017;23:928–32.
- [25] Liu JH, He FE, Wen LF, et al. Clinical observation on the effect of levocarnitine combined with acupuncture on idiopathic oligospermia. *J North Pharm* 2017;14:110–1.
- [26] Zhang M, Huang G, Lu F, et al. Influence of acupuncture on idiopathic male infertility in assisted reproductive technology. *J Huazhong Univ Sci Technol* 2002;22:228–30.
- [27] Siterman S, Eltes F, Wolfson V, et al. Effect of acupuncture on sperm parameters of males suffering from subfertility related to low sperm quality. *Arch Androl* 1997;39:7.
- [28] Acar O, Esen T, Colakoglu B, et al. Improving testicular blood flow with electroacupuncture-like percutaneous nerve stimulation in an experimental rat model of testicular torsion. *Neuromodulation* 2015;18:324–8.
- [29] Siterman S, Eltes F, Schechter L, et al. Success of acupuncture treatment in patients with initially low sperm output is associated with a decrease in scrotal skin temperature. *Asian J Androl* 2009;11:200–8.