

Efficacy and Safety of Acupuncture and Acupuncture-Combined Therapies in the Treatment of Sciatica Caused by Lumbar Disc Herniation: A Network Meta-Analysis

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Purpose: Sciatica is a common complication of lumbar disc herniation (LDH). This network meta-analysis compared the efficacy of acupuncture monotherapies, acupuncture versus conventional rehabilitation, and acupuncture monotherapy versus combination therapies for LDH-related sciatica.

Patients and Methods: We systematically searched PubMed, Embase, Cochrane Library, Web of Science, CNKI, Wanfang, CQVIP, and CBM. Bayesian network meta-analysis was performed using RStudio and GEMTC. STATA generated network and funnel plots. Treatment rankings were assessed using the Surface Under the Cumulative Ranking curve (SUCRA). Bias risk was evaluated with the Cochrane Risk of Bias tool 2.0.

Results: According to SUCRA, in terms of total effective rate, the more effective intervention was electroacupuncture combined with cupping therapy (EA+Cupping, 92.93%); in terms of VAS, the better intervention was needle knife combined with rehabilitation therapy (NK+RT, 95.96%); in terms of ODI, the more effective intervention was electroacupuncture combined with cupping therapy (EA+Cupping, 98.03%); in terms of JOA, the best intervention was electrostimulation combined with rehabilitation therapy (ES+RT, 88.27%); in terms of IL-6 and TNF- α , the better intervention was electroacupuncture combined with electrostimulation (EA+ES, 99.99%).

Conclusion: Acupuncture combined with other therapies demonstrates superior efficacy compared to rehabilitation treatment. Specifically, NK+RT is possibly a more effective intervention for pain relief; EA+Cupping shows a better benefit in improving disability and quality of life; ES+RT is likely a more effective strategy for promoting neurological recovery; and EA+ES is possibly better in reducing inflammatory responses.

Keywords: acupuncture, related therapies, sciatica, lumbar disc herniation, network meta-analysis

Introduction

Lumbar disc herniation (LDH) is a prevalent spinal disorder primarily featuring radicular pain, sensory disturbances, and weakness in one or more lumbosacral nerve root distributions.¹ Sciatica, among the most common complications of LDH, typically refers to pain radiating from the buttock down the lower limb as a result of sciatic nerve irritation.² Among its various etiologies, approximately 90% of sciatica cases are attributed to nerve root compression caused by herniated lumbar discs.³ The lifetime prevalence of sciatica is estimated to range between 13% and 30%, with annual incidence peaking around the age of 40 and rarely occurring before the age of 20. Sciatica can lead to significant pain and disability, placing a substantial burden on both affected individuals and society. Conservative treatment remains the first-

line approach for most patients, with symptom relief commonly achieved through non-invasive measures such as simple analgesics and physical therapy,^{4,5} while only 5% to 10% of patients with intractable sciatica ultimately require surgical intervention.⁶

At present, non-surgical treatment remains the first-line approach for managing this condition. Among pharmacologic interventions, non-steroidal anti-inflammatory drugs (NSAIDs) may provide short-term symptomatic relief. Glucocorticoids are also employed. Nevertheless, their mechanisms of action remain incompletely understood and are often accompanied by significant adverse effects.⁷ Gabapentin and pregabalin are also commonly prescribed for LDH-associated pain. However, gabapentin has a short half-life (5–7 hours), carries a risk of misuse, and demonstrates dose-dependent efficacy.⁸ Pregabalin, while effective in short-term analgesia, shows limited benefit in long-term pain control and is associated with neurological side effects.⁹ Therefore, there is a pressing need for therapeutic modalities that are minimally resource-intensive, have fewer side effects, and yield a sustained total effective rate. Acupuncture, as a non-surgical therapeutic modality, has shown considerable promise in alleviating both acute and chronic symptoms of sciatica. It is increasingly recognized for its potential advantages, including minimal invasiveness, a favorable safety profile, and sustained efficacy.¹⁰ Moreover, certain studies suggest that acupuncture may even surpass conventional pharmacotherapy in terms of total effective rate.¹¹

A recent meta-analysis evaluated the efficacy and safety of acupuncture in the treatment of sciatica, concluding that acupuncture is both effective and safe.¹² However, acupuncture encompasses various techniques, such as fire acupuncture (FA), warm acupuncture (WA), needle knife (NK), and electrostimulation (ES), each of which has demonstrated efficacy to some extent. The foregoing meta-analysis focused solely on pairwise comparisons between two interventions at a time and did not account for the complexity and diversity of available therapeutic strategies. Therefore, the optimal approach for managing sciatica secondary to LDH in clinical practice remains unclear.

Network meta-analysis (NMA), by integrating both direct and indirect evidence across multiple interventions, allows for comprehensive comparative evaluations. This method facilitates a nuanced understanding of the relative efficacy and safety of diverse therapeutic options and aids in identifying the most favorable treatment strategies. To date, no systematic evaluation has been conducted to compare the effectiveness and safety of different acupuncture modalities for sciatica caused by LDH. Therefore, this study employed an NMA to assess the comparative efficacy of various acupuncture monotherapies, acupuncture versus conventional rehabilitation therapies, and acupuncture monotherapy versus combination treatments for LDH-induced sciatica. The aim is to provide robust, evidence-based recommendations to inform clinical decision-making and optimize acupuncture-based treatment strategies.

Materials and Methods

This study complied with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, including specific recommendations for network meta-analyses (NMA) ([Table S1](#)). The protocol was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO) (Registration No.: CRD420250647816).

Search Strategy

A comprehensive literature search was performed across eight electronic databases: PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Database, Chongqing VIP Database (CQVIP), and China Biology Medicine Disc (CBM). The search covered articles published from the inception of each database until February 10, 2025, and only studies published in English or Chinese were retrieved. The search strategy combined subject terms with free-text keywords, incorporating the following Medical Subject Headings (MeSH): acupuncture, LDH, and sciatica. Additionally, a manual search was conducted for potentially eligible studies by screening the references of relevant articles and searching for grey literature. The search strategy is detailed in [Table S2](#).

Inclusion and Exclusion Criteria

Studies meeting the following criteria were included: (1) Population: patients with sciatica caused by LDH; (2) Intervention/Exposure: acupuncture or related therapies; (3) Study Design: randomized controlled trials (RCTs); (4) Outcomes: total effective rate, Visual Analogue Scale (VAS), Oswestry Disability Index (ODI), Japanese Orthopaedic Association scores (JOA), Interleukin-6 (IL-6), Tumor Necrosis Factor- α (TNF- α) and adverse events (AEs).

The following studies were excluded: (1) animal or cell-based experiments, case reports, study protocols, reviews, letters, editorials, and conference abstracts; (2) studies with missing or seriously flawed data; (3) duplicates; (4) studies for which the full text was unavailable; (5) studies involving duplicate participants.

Data Extraction

All retrieved records were imported into EndNote software. Two reviewers (Ni and Tong) independently screened the titles and abstracts against the inclusion and exclusion criteria. Full texts were then reviewed for a second round of eligibility assessment. Discrepancies were resolved through discussion or consultation with a third reviewer (Wei). Data extraction was conducted independently by the same two reviewers using a predesigned electronic data collection form. Extracted data included: first author, year of publication, study design, country, intervention and control measures, sample size, sex, age, treatment duration, and outcome indicators.

Quality Assessment

Two reviewers (Ni and Tong) independently assessed the methodological quality of the included studies using the Cochrane Risk of Bias Tool (ROB 2.0). The ROB 2.0 framework evaluates five domains: randomization process, deviations from the intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result.¹³ Each domain was rated as “low risk”, “some concerns”, or “high risk”. Studies were classified as follows: low risk if all domains were rated as low risk, or if one domain was rated as some concerns while the rest were low risk; high risk if at least one domain was rated as high risk, or if four or more domains were rated as some concerns; some concerns applied to all other cases. All assessments were conducted independently by two reviewers. Any disagreements were resolved through discussion or adjudication by a third reviewer (Wei).

Statistical Analysis

The outcome indicators included in the present study comprised both continuous and dichotomous variables. For continuous variables, the mean difference (MD) along with its 95% credible interval (CrI) was employed as the measure of effect size. For dichotomous variables, relative risks (RRs) and their corresponding 95% CrIs were used. A Bayesian NMA model was constructed using the Markov Chain Monte Carlo (MCMC) method, with iterative procedures performed to estimate the relative efficacy of various treatment regimens. The model specifications comprised four chains, an initial burn-in period of 10,000 iterations, a total of 50,000 iterations, a thinning interval of 10, and an initial value of 2.5, all implemented to derive the posterior distribution. The NMA was conducted under three core assumptions: transitivity, homogeneity, and consistency. Heterogeneity was assessed using the `mtc.anohet` function from the `GeMTC` package. An overall I^2 value below 50% was deemed indicative of acceptable heterogeneity within comparisons, thus supporting the homogeneity assumption. Inconsistency between direct and indirect evidence was examined through the node-splitting approach using the `mtc.nodesplit` function in `GeMTC`. A p-value greater than 0.05 indicated no significant inconsistency, thereby satisfying the consistency assumption. In the constructed network, each treatment intervention was represented as a node, with edges illustrating the standardized MDs between interventions. Model convergence was evaluated by the potential scale reduction factor (PSRF) via the `gelman.diag` function in `GeMTC`, where a PSRF value below 1.05 was interpreted as evidence of successful convergence.¹⁴ Cumulative ranking probabilities were estimated and presented as the surface under the cumulative ranking curve (SUCRA) values to facilitate the interpretation of the relative total effective rate. Funnel plots were utilized to assess potential publication bias. All statistical analyses were enabled by R 4.4.2 and STATA 15.1.

Results

Literature Search and Selection Process

1458 articles were initially retrieved. After removing 590 duplicates, 707 articles were excluded following a preliminary review of titles and abstracts. The remaining studies were subjected to full-text screening based on predefined eligibility criteria. Finally, 94 studies were encompassed. The detailed selection process is illustrated in Figure 1.

Basic Characteristics and Quality Assessment of Included Studies

The 94 included studies^{10,15-107} originated from two countries (China and South Korea), involving 6928 patients, of whom 43% were male and 57% female, with ages ranging from 32 to 66 years. 33 different intervention modalities were studied, including Manual Acupuncture (MA), Electroacupuncture (EA), Sham Acupuncture (SA), Chinese Herbal Medicine (CM), Conventional Pharmaceuticals (CP), Rehabilitation Treatment (RT), ES, WA, EA combined with CM (EA+CM), MA combined with CP (MA+CP), MA combined with CM and CP (MA+CM+CP), MA combined with Massage (MA+Massage), ES combined with RT (ES+RT), NK, Massage, MA combined with ES (MA+ES), EA combined with WA (EA+WA), MA combined with RT (MA+RT), NK combined with RT (NK+RT), MA combined with Moxibustion (MA+Moxibustion), WA combined with RT (WA+RT), CM combined with CP (CM+CP), FA, EA

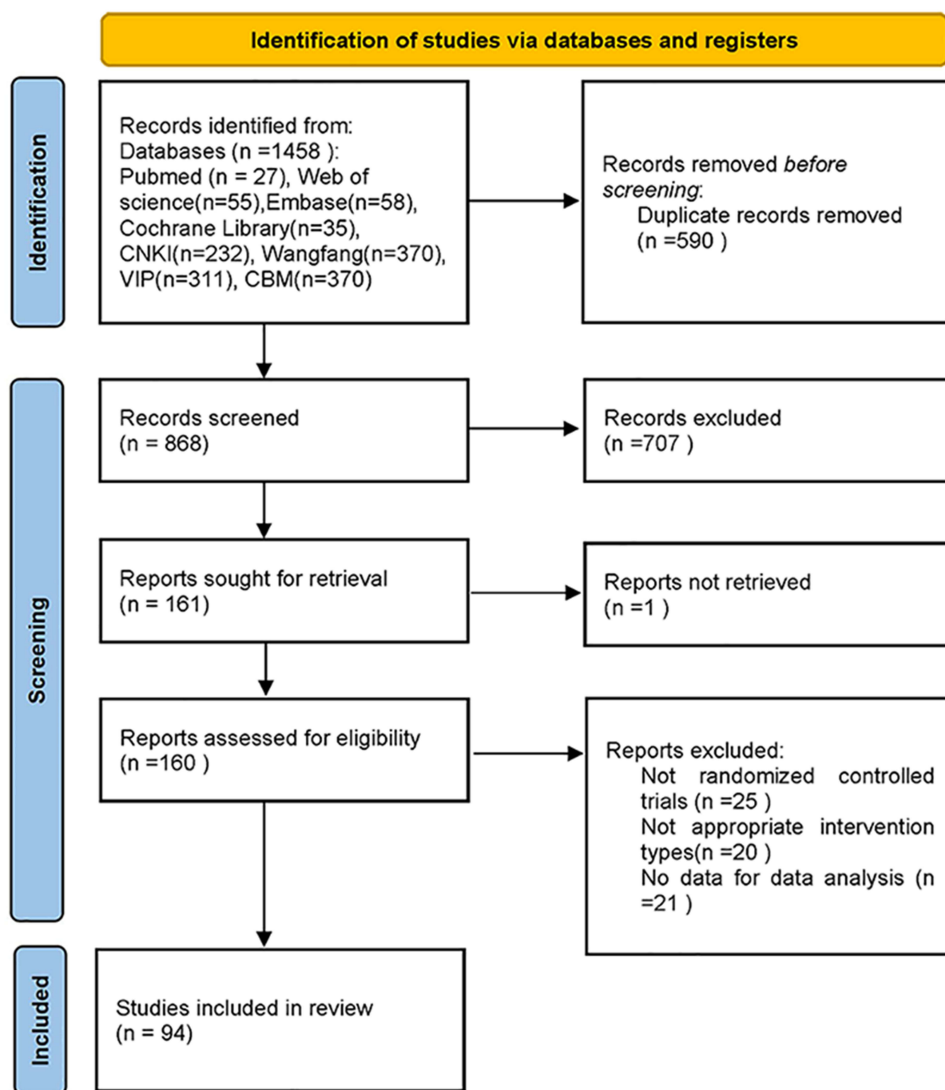


Figure 1 Flowchart for literature search and screening.

combined with CP (EA+CP), FA combined with MA (FA+MA), EA combined with MA (EA+MA), EA combined with ES (EA+ES), EA combined with RT (EA+RT), EA combined with RT and CP (EA+RT+CP), EA combined with Cupping (EA+Cupping), EA combined with Massage (EA+Massage), and EA combined with Bloodletting (EA+Bloodletting). The fundamental characteristics of the included studies are summarized in Table 1. Definition of interventions are detailed in Table S3.

Table 1 Basic Characteristics of Included RCTs

First Author	Year	Study Design	Region	Intervention (Group)	Sample	Sex (Male/Female)	Age	Course	Outcome
Xiantong Liu et al	2015	RCT	China	EA	53	32/21	39.5±10.2	10d	Total effective rate
				Massage	53	30/23	38.7±9.5	10d	
Danzi Chen et al	2024	RCT	China	MA+CM	30	16/14	58.90±15.55	14d	Total effective rate, VAS, IL-6
				MA	30	15/15	58.90±15.55	14d	
Mengrui Zhang et al	2023	RCT	China	EA+Bloodletting	30	19/11	46.17±5.34	5d	Total effective rate, VAS, JOA, ODI, IL-6, TNF- α
				EA	46	24/22	44.3±11.7	7d	
Chao Ma et al	2021	RCT	China	ES+RT	100	54/46	48±11	30d	Total effective rate, VAS, JOA, ODI
				RT	100	52/48	47±12	30d	
Yan Lin	2023	RCT	China	EA+ES	45	26/19	40.46±6.23	5d	Total effective rate, VAS, ODI, IL-6, TNF- α
				EA	45	28/17	40.66±6.20	5d	
Jianguo Li et al	2021	RCT	China	EA+ES	49	47/32	47.25±5.73	14d	Total effective rate, VAS
				ES	49	45/34	47.78±6.12	14d	
Xiuhui Chen et al	2006	RCT	China	EA+RT	30	18/12	40.1	30d	VAS
				RT	30	16/14	39.6	30d	
Yuchen Xie et al	2023	RCT	China	EA+MA	61	30/31	56.28±7.24	6d	VAS, IL-6, TNF- α
				EA	60	28/32	56.75±7.51	6d	
Xue Zhang et al	2022	RCT	China	EA	50	78/22	50.26±12.39	28d	ODI
				ES	50	78/22	48.08±12.98	28d	
Zhongping Shen	2016	RCT	China	EA+RT	59	27/32	52.8±7.5	30d	VAS
				CP	59	26/33	46.8±2.5	30d	
Min Wang et al	2005	RCT	China	EA	60	40/20	33	42d	Total effective rate, VAS
				MA	62	41/21	36	42d	
Xiaoqin Chen et al	2016	RCT	China	EA+Massage	45	21/24	38.2±9.6	14d	Total effective rate
				EA	45	22/23	40.1±10.2	14d	
Xiaodan Xv	2018	RCT	China	EA	42	20/22	46.3±7.5	21d	Total effective rate, VAS
				RT	42	22/20	47.1±78.6	21d	
				EA+RT	42	19/23	45.9±8.3	21d	
Hongzhui Pan	2021	RCT	China	EA+Cupping	45	23/22	42.7±8.9	14d	VAS
				WA	45	22/23	43.1±9.5	14d	
Li Chen et al	2021	RCT	China	EA+Cupping	45	22/23	49.6±14.5	10d	Total effective rate, VAS, ODI
				WA	45	23/22	50.5±13.3	10d	
Yan Zhou et al	2016	RCT	China	EA+RT	50			10d	Total effective rate, VAS
				EA	50			10d	
Wenbo Fu et al	2023	RCT	China	EA+MA	61	39/22	56.82±7.19	28d	VAS, IL-6, TNF- α
				MA	60	38/22	57.54±7.13	28d	
Xi Wu et al	2015	RCT	China	EA	66	24/40	46.1±11.9	42d	VAS
				EA+RT	67	22/44	46.6±10.7	42d	
				EA+RT+CP	65	25/39	43.7±11.7	42d	
Suzhen Yan	2022	RCT	China	EA	40	24/16	46.28±10.30	10d	Total effective rate, VAS, JOA
				ES	40	22/18	47.60±10.20	10d	
				EA+ES	40	20/20	45.18±9.82	10d	
Binxiang Wang et al	2004	RCT	China	EA	23			7d	VAS
				CP	17			7d	

(Continued)

Table 1 (Continued).

First Author	Year	Study Design	Region	Intervention (Group)	Sample	Sex (Male/Female)	Age	Course	Outcome
Xia Liu	2013	RCT	China	EA+MA	54	33/21	47	10d	Total effective rate
				MA	47	26/21	47	10d	
Guanghui Zhou et al	2009	RCT	China	EA+RT	60	33/27	38.1±10.1	14d	Total effective rate, VAS
				RT	60	35/25	37.3±11.9	14d	
Xuejun Zhao	2016	RCT	China	EA	31	18/13	32.1±2.5	5d	Total effective rate
				MA	31	17/14	32.5±2.1	5d	
Fanying Meng	2011	RCT	China	EA+MA	37			5d	Total effective rate
				MA	38			5d	
Jiangbo Tian	2018	RCT	China	EA	50	28/22	33.5±2.5	5d	Total effective rate
				MA	50	30/20	33.8±2.0	5d	
Shengwu Li et al	2019	RCT	China	MA	72	34/38	57.42±7.54	5d	Total effective rate, VAS
				EA	70	31/39	58.03±7.35	5d	
Zhengta Yang	2018	RCT	China	MA	30	15/15	61.5±1.3	14d	Total effective rate, VAS
				EA	30	16/14	60.5±1.5	14d	
Shengwu Li et al	2016	RCT	China	MA	33	19/14	57.42±7.54	5d	Total effective rate, VAS
				EA	32	21/11	58.03±7.35	5d	
Huawei Hou	2017	RCT	China	MA+CM	42	14/28	52.3±3.5	10d	Total effective rate
				MA	42	14/28	52.3±3.5	10d	
Haotian Pan et al	2022	RCT	China	FA+MA	38	22/16	57±10	21d	VAS, ODI
				MA	38	14/24	55±10	21d	
Weili Qian	2019	RCT	China	EA+CP	25	19/6	66.25±3.58	10d	Total effective rate
				EA	25	17/8	67.96±2.15	10d	
Qiaoyun Shi et al	2019	RCT	China	FA	45	22/23	52±5	10d	Total effective rate
				RT	45	21/24	54±4	10d	
Hengjie Zhao et al	2023	RCT	China	FA	50	16/34	49.51±4.30	7d	Total effective rate, VAS, IL-6, TNF-α
				MA	50	17/33	49.28±4.68	7d	
Qiansong He	2019	RCT	China	FA	32	18/14	56.81±7.58	7d	Total effective rate, VAS, IL-6, TNF-α
				MA	33	19/14	56.91±7.67	7d	
Aijun Liang et al	2021	RCT	China	MA+RT	32	22/10	52.42±9.82	56d	Total effective rate, VAS, ODI
				MA	32	20/12	51.39±9.7	56d	
Minghui Li	2019	RCT	China	MA+RT	40	28/12	39.60±9.40	21d	Total effective rate, VAS, ODI
				MA+Massage	40	26/14	41.30±7.80	21d	
Qirui Cai et al	2021	RCT	China	MA+RT	32	22/10	52.42±9.82	7d	Total effective rate, VAS, ODI
				MA	32	20/12	51.39±9.75	7d	
Rongyan Deng et al	2023	RCT	China	MA+CP	44	24/20	43.17±2.46	6d	Total effective rate, VAS, ODI
				CP	44	25/19	43.29±2.61	6d	
Congzhe Zhao et al	2024	RCT	China	MA+CM+CP	52	31/21	51.32±8.75	28d	Total effective rate, IL-6, TNF-α
				CM+CP	52	31/21	50.19±9.24	28d	
Zhenglin Lu et al	2021	RCT	China	MA+CM	57	31/26	53.34±10.5	14d	VAS, IL-6, TNF-α
				MA	57	29/28	52.32±9.9	14d	
Miao He et al	2022	RCT	China	MA+CM	43	28/15	45.39±1.47	28d	Total effective rate, VAS, IL-6
				MA	43	29/14	45.22±1.28	28d	
Qiu Jin et al	2020	RCT	China	WA	37	20/17	46.2±9.4	7d	Total effective rate, VAS, TNF-α
				MA	36	17/19	45.6±11.6	7d	
Qiu Jin et al	2022	RCT	China	WA	32	13–19	44.12±6.02	14d	Total effective rate, VAS, ODI
				SA	27	13/14	42.64±5.93	14d	
				CP	30	11/19	45.28±6.72	14d	
				CP	30	11/19	45.28±6.72	14d	
Yeyan Wei	2022	RCT	China	WA	51	26/25	53.24±13.8	7d	VAS, JOA
				CP	51	25/26	50.14±14.63	7d	
Yanlong Tan	2013	RCT	China	MA	25	16/9	35.2	20d	Total effective rate, VAS
				EA	25	13/12	36.1	20d	

(Continued)

Table 1 (Continued).

First Author	Year	Study Design	Region	Intervention (Group)	Sample	Sex (Male/Female)	Age	Course	Outcome
Zugang Zhou et al	2011	RCT	China	MA	50	28/22	34.1±5.7	21d	Total effective rate, VAS
				EA	50	26/24	35.3±6.4	21d	
Yi Li	2023	RCT	China	MA+CM	39	27/12	59.60±4.65	28d	Total effective rate, VAS, ODI
				CM	39	29/10	59.64±4.62	28d	
Baoyu Shan	2018	RCT	China	EA+Massage	33			28d	VAS
				RT	33			28d	
Jun Wang et al	2016	RCT	China	MA+CP	27	14/13	46.09±17.96	14d	Total effective rate
				MA	27	15/12	45.23±18.37	14d	
Hailin He	2020	RCT	China	WA+RT	50	28/22	44.50±5.11	15d	Total effective rate, VAS, JOA
				RT	50	29/21	43.58±4.69	15d	
Jinzhu An	2021	RCT	China	WA	55	27/28	50.1±4.6	20d	Total effective rate
				MA	55	16/39	50.5±4.0	20d	
Liyin Zhang et al	2023	RCT	China	WA	30	15/15	49.5±4.9	14d	Total effective rate, VAS
				CP	30	17/13	49.0±5.4	14d	
Haixia Deng	2019	RCT	China	WA	33	17/16	40.54±2.52	14d	Total effective rate, VAS, JOA
				EA	33	16/17	40.11±3.55	14d	
Xiangyun Jia	2018	RCT	China	WA+EA	25		41.5	14d	Total effective rate
				EA	25		38.5	14d	
Juan Deng et al	2023	RCT	China	MA+Massage	39	22/17	48.48±7.69	21d	VAS, JOA
				RT	39	23/16	48.26±7.23	21d	
Long Yang et al	2023	RCT	China	MA+RT	62	32/30	55.25±6.43		Total effective rate, VAS, ODI
				RT	62	35/27	54.72±4.76		
Yingchu Shi et al	2023	RCT	China	MA+CM	42	22/20	53.3±10.4	14d	Total effective rate, VAS
				MA	42	23/19	52.6±9.8	14d	
Wenjun Yu et al	2024	RCT	China	MA+ES	85	36/43	64.39±7.39	14d	Total effective rate, VAS, JOA, ODI
				ES	85	45/36	65.98±7.87	14d	
Junwei Yu et al	2022	RCT	China	MA+Massage	30	15/15	39.15±6.29		VAS, ODI
				RT	30	15/15	39.18±5.94		
Xueqi Deng	2024	RCT	China	MA+CM	25	14/11	61.59±4.20	14d	Total effective rate, VAS, ODI
				MA	25	15/10	61.53±4.23	14d	
Qi Hu et al	2021	RCT	China	MA+CM	61	29/32	51.19±3.28	14d	JOA
				MA	61	33/28	51.89±3.48	14d	
Meng Pan et al	2024	RCT	China	MA	54	22/32	61.7±7.4	7d	ODI
				+Moxibustion					
				MA	53	15/38	60.0±6.6	7d	
Haihua Liu et al	2024	RCT	China	MA	67	42/25	56.18±8.26	21d	ODI
				ES	67	44/23	55.34±7.92	21d	
				MA+ES	67	39/28	53.85±8.56	21d	
Jianmin Shou	2018	RCT	China	MA+CP	40	29/11	41.0±5.0	30d	Total effective rate, VAS
				CP	40	30/10	42.0±5.2	30d	
Wei Guan et al	2021	RCT	China	MA	30	17/13	47.3±6.2	7d	Total effective rate, TNF- α
				Massage	30	18/12	42.7±5.2	7d	
Yun Zhang et al	2013	RCT	China	NK+RT	42	27/15	47.4±10.4	14d	Total effective rate
				RT	42	23/19	47.5±11.6	14d	
Weiwei Zhu et al	2022	RCT	China	NK+RT	40	22/18	54.15±1.24	20d	Total effective rate
				MA+RT	40	23/17	54.16±1.25	20d	
Qinghua Ye et al	2021	RCT	China	NK	70	43/27	45.24±4.73	28d	VAS
				MA+Massage	70	40/30	46.24±4.27	28d	
Xiaozhan Qian	2021	RCT	China	MA	80	52/28	48.3±2.9	30d	VAS
				CP	80	46/34	49.7±3.3	30d	
Chengxiu Wang et al	2016	RCT	China	MA+CM+CP	41	27/14	45.6±8.3	14d	Total effective rate
				CP	41	29/12	47.3±9.2	14d	

(Continued)

Table 1 (Continued).

First Author	Year	Study Design	Region	Intervention (Group)	Sample	Sex (Male/Female)	Age	Course	Outcome
Yuanxin Wang et al	2016	RCT	China	MA+CM	39	28/11	54.5±4.7	28d	Total effective rate, VAS
				MA	39	25/14	54.3±4.6	28d	
Long Li et al	2014	RCT	China	MA+CP	34	19/15	47.5±2.5	28d	Total effective rate, VAS
				CP	34	20/14	49.5±2.5	28d	
Jianbing Li et al	2019	RCT	China	MA	46	29/17	56.5±14.5	14d	Total effective rate, VAS, ODI
				CP	46	26/20	55.5±14.5	14d	
Xiangxin Li	2020	RCT	China	MA+CP	27	17/10	45.41±8.32	14d	Total effective rate, VAS
				CP	27	13/14	43.41±9.75	14d	
Yan Gu	2020	RCT	China	MA	35		54.23±1.54		Total effective rate, VAS
				CP	35		54.23±1.54		
Jun Wang	2021	RCT	China	MA	39	19/20	47.86±3.53	14d	Total effective rate, VAS
				CP	39	18/21	48.18±3.65	14d	
Wenkai Zheng	2019	RCT	China	MA	155	87/68	46.8±5.3	14d	Total effective rate
				CP	155	88/67	47.3±6.1	14d	
Jiaying Liu	2015	RCT	China	MA	48	29/19	45±8.23	7d	Total effective rate
				CP	48	30/18	43±7.89	7d	
Haiming Shang et al	2014	RCT	China	MA	60	36/24	48	7d	Total effective rate
				CP	60	38/22	45.5	7d	
Yaqian Jiang	2018	RCT	China	MA	60	38/22	47.15±2.55	7d	Total effective rate
				CP	60	37/23	46.65±2.48	7d	
Fang Huo	2020	RCT	China	MA	60	34/26	56.7±3.3	14d	Total effective rate, VAS
				CP	60	36/24	58.3±2.6	14d	
Dundun Zhang et al	2022	RCT	China	MA	75	40/35	56.08±3.14	14d	Total effective rate, VAS, ODI
				CP	75	38/37	55.82±3.68	14d	
Guangrong Cen	2011	RCT	China	MA+CM	75	40/35	51.5	15d	Total effective rate
				MA	75	39/36	48.5	15d	
Yuping Tang et al	2019	RCT	China	MA	48	25/23	34.96 ±9.37	10d	Total effective rate, VAS, IL-6, TNF- α
				CP	48	27/21	35.65±10.22	10d	
Xiao Du	2023	RCT	China	ES+RT	78	47/31	49.75±6.28	30d	VAS, JOA, ODI
				RT	78	51/27	50.33±6.17	30d	
Haibao Wu et al	2024	RCT	China	ES+RT	57	33/24	57.62±1.94	28d	Total effective rate, VAS, JOA, ODI, IL-6, TNF- α
				RT	39	24/15	57.63±1.95	28d	
Jiangdong Zhang et al	2023	RCT	China	MA+CP	40	27/13	52.03±9.72	7d	VAS
				CP	40	29/11	52.48±9.56	7d	
Weili Wang et al	2024	RCT	China	EA+CM	64	31/33	64.39±13.46	14d	VAS, ODI, JOA
				EA	64	31/33	64.06±11.76	14d	
Jianfeng Tu et al	2024	RCT	China	MA	108	77/31	51.61±14.9	28d	VAS, ODI
				SA	108	70/38	50.9±15.5	28d	
Bonhyuk Goo et al	2024	RCT	South Korea	MA+CM	37	17/20	50.6±10.66	42d	VAS, ODI
				MA+CP	37	18/18	54.2±8.58	42d	
Ziling Huang et al	2019	RCT	China	MA	23	17/6	63.00±14.00	28d	VAS, ODI
				SA	23	8/15	63.00±11.00	28d	
Lengge Si et al	2024	RCT	China	WA	42	26/16	45.0±11.8	28d	Total effective rate, VAS
				SA	38	21/17	42.0±12.5	28d	
				CP	40	29/11	44.0±16.8	28d	
Cheng Li et al	2021	RCT	China	MA	37	11/26	56.91±8.33	7d	VAS, OD
				SA	36	12/24	57.28±9.74	7d	
Xue Zhang et al	2017	RCT	China	EA	50	22/78	54.26±12.39	14d	ODI
				ES	50	22/78	51.08±12.98	14d	

Abbreviations: MA, Manual acupuncture; EA, Electroacupuncture; SA, Sham acupuncture; CM, Chinese herbal medicine; CP, Conventional pharmaceuticals; RT, Rehabilitation treatment; ES, Electrostimulation; WA, Warm acupuncture; NK, Needle knife; FA, Fire acupuncture.

The risk of bias assessment revealed that 40 studies were rated as having a low risk of bias, 54 as moderate risk, and none as high risk. Concerning the randomization process, 50 studies employed the randomized number Table method, 40 studies reported randomization without specifying the method, and 4 studies assigned participants according to the order of visits. None of the studies implemented allocation concealment. Due to the nature of the interventions, blinding was generally challenging; only six studies reported blinding procedures, while the remainder did not mention blinding. No studies performed intention-to-treat analyses. All studies provided complete outcome data with no evidence of selective reporting, and no other apparent sources of bias were detected. Further details are presented in [Figure 2](#).

NMA Results

Network Diagram

In the network diagram, each node represents a specific intervention, with the size of the node proportional to the number of studies involving that intervention. Larger nodes indicate a greater number of included studies. Lines connecting two nodes indicate direct comparisons between the corresponding interventions, with the thickness of the lines reflecting the number of comparative studies. Thicker lines denote more studies. Closed loops were formed in the network for four outcome indicators: total effective rate, VAS, ODI, and JOA. In contrast, no closed loops were observed for IL-6 and TNF- α . Details are presented in [Figure 3](#). Node-splitting analysis was employed to assess inconsistency within closed loops. The posterior residual deviance was equal to 1 across all outcomes, suggesting successful model convergence. For some outcomes (eg, total effective rate, VAS, ODI), P less than 0.05 indicated potential local inconsistency, while for the remaining endpoints, P exceeded 0.05, indicating no significant inconsistency.

Total Effective Rate

66 studies reported on the total effective rate. The results of the NMA indicated that, compared with RT alone, the following interventions significantly improved the total effective rate in patients with sciatica due to LDH: MA [MA vs RT: MD = 1.14, 95% CrI: (1.02, 1.28)]; EA [EA vs RT: MD = 1.13, 95% CrI: (1.01, 1.27)]; WA [WA vs RT: MD = 1.30, 95% CrI: (1.14, 1.51)]; MA + CM [MA+CM vs RT: MD = 1.31, 95% CrI: (1.16, 1.50)]; MA + Massage [MA+Massage vs RT: MD = 1.31, 95% CrI: (1.12, 1.55)]; ES + RT [ES+RT vs RT: MD = 1.31, 95% CrI: (1.10, 1.57)]; MA + ES [MA+ES vs RT: MD = 1.55, 95% CrI: (1.18, 2.10)]; EA + WA [EA+WA vs RT: MD = 1.34, 95% CrI: (1.09, 1.75)]; MA + RT [MA+RT vs RT: MD = 1.32, 95% CrI: (1.17, 1.50)]; NK + RT [NK+RT vs RT: MD = 1.67, 95% CrI: (1.34, 2.17)]; MA + Moxibustion [MA+Moxibustion vs RT: MD = 1.26, 95% CrI: (1.12, 1.44)]; WA + RT [WA+RT vs RT: MD = 1.25, 95% CrI: (1.02, 1.57)]; FA [FA vs RT: MD = 1.21, 95% CrI: (1.03, 1.42)]; EA + CP [EA+CP vs RT: MD = 1.35, 95% CrI: (1.05, 1.79)]; EA + MA [EA+MA vs RT: MD = 1.25, 95% CrI: (1.14, 1.40)]; EA + ES [EA+ES vs RT: MD = 1.48, 95% CrI: (1.24, 1.85)]; EA + RT [EA+RT vs RT: MD = 1.27, 95% CrI: (1.15, 1.40)]; EA + Cupping [EA+Cupping vs RT: MD = 1.58, 95% CrI: (1.38, 1.83)]; EA + Bloodletting [EA+Bloodletting vs RT: MD = 1.50, 95% CrI: (1.18, 2.02)]. In contrast, treatment with SA led to a significantly reduced total effective rate [SA vs RT: MD = 0.61, 95% CrI: (0.43, 0.86)]. Details are provided in [Figure 4A](#).

The SUCRA probability rankings demonstrated that DAYU was a better intervention in improving the total effective rate. Further details are displayed in [Figure 4B](#).

VAS

64 studies reported outcomes based on VAS. The results of the NMA indicated that, compared with rehabilitation therapy (RT) alone, patients with sciatica owing to LDH experienced significantly greater reductions in VAS scores following the interventions of ES combined with rehabilitation therapy (ES+RT vs RT: MD = -1.26, 95% CrI [-1.45, -1.07]), NK (NK vs RT: MD = -0.93, 95% CrI [-1.54, -0.32]), MA combined with rehabilitation therapy (MA+RT vs RT: MD = -0.53, 95% CrI [-0.93, -0.14]), NK combined with rehabilitation therapy (NK+RT vs RT: MD = -3.30, 95% CrI [-3.72, -2.89]), warming needle moxibustion combined with rehabilitation therapy (WA+RT vs RT: MD = -3.09, 95% CrI [-3.79, -2.40]), EA combined with MA (EA+MA vs RT: MD = -0.45, 95% CrI [-0.85, -0.05]), and EA combined with massage (EA+Massage vs RT: MD = -1.46, 95% CrI [-1.77, -1.15]). Conversely, significant increases in VAS scores were observed following MA (MA vs RT: MD = 1.57, 95% CrI [1.21, 1.91]), EA (EA vs RT: MD = 1.49, 95% CrI [1.16, 1.82]), SA (RT vs RT: MD = 5.19, 95% CrI [4.62, 5.76]), CM (CM vs RT: MD = 1.17, 95% CrI [0.67, 1.67]), CP (CP vs

Study ID	D1	D2	D3	D4	D5	Overall						
Xiantong Liu2015	!	!	+	+	+	!	Zugang Zhou2011	+	!	+	+	+
Xiantong Liu2015	!	!	+	+	+	!	Yi Li2023	+	!	+	+	+
Danzi Chen2024	!	!	+	+	+	+	Baoyu Shan2018	+	!	+	+	+
Mengrui Zhang2023	!	!	+	+	+	!	Jun Wang2016	+	!	+	+	+
Chao Ma2021	!	!	+	+	+	!	Hailin He2020	!	!	+	+	!
Yan Lin2023	!	!	+	+	+	!	Jin Zhu An2021	!	!	+	+	!
Jianguo Li2021	!	!	+	+	+	!	Liyin Zhang2023	!	!	+	+	!
Xiuhui Chen2006	!	!	+	+	+	+	Haixia Deng2019	!	!	+	+	!
Yuchen Xie2023	!	!	+	+	+	!	Xiangyun Jia2018	+	!	+	+	+
Xue Zhang2022	+	!	+	+	+	+	Juan Deng2023	!	!	+	+	!
Zhongping Shen2016	!	!	+	+	+	!	Long Yang2023	+	!	+	+	+
Min Wang2005	!	+	+	+	+	!	Yingchu Shi2023	+	!	+	+	+
Xiaoqin Chen2016	!	!	+	+	+	!	Wenjun Yu2024	!	!	+	+	!
Xiaodan Xv2018	+	!	+	+	+	+	Junwei Yu2022	+	!	+	+	+
Hongzhui Pan2021	!	!	+	+	+	!	Xueqi Deng2024	+	!	+	+	+
Li Chen2021	!	!	+	+	+	!	Qi Hu2021	!	!	+	+	!
Yan Zhou2016	+	!	+	+	+	+	Meng Pan2024	+	!	+	+	+
Wenbo Fu2023	!	!	+	+	+	!	Haihua Liu2024	!	!	+	+	!
Xi Wu2015	!	!	+	+	+	!	Jianmin Shou2018	!	!	+	+	!
Suzhen Yan2022	!	!	+	+	+	!	Wei Guan2021	+	!	+	+	+
Binxiong Wang2004	!	!	+	+	+	!	Yun Zhang2013	+	!	+	+	+
Xia Liu2013	!	!	+	+	+	!	Weiwei Zhu2022	!	!	+	+	!
Guanghui Zhou2009	!	!	+	+	+	!	Qinghua Ye2021	!	!	+	+	!
Xuejun Zhao2016	!	!	+	+	+	!	Xiaozhan Qian2021	!	!	+	+	!
Fanying Meng2011	!	!	+	+	+	!	Chengxiu Wang2016	!	!	+	+	!
Jiangbo Tian2018	+	!	+	+	+	+	Yuanxin Wang2016	!	!	+	+	!
Shengwu Li2019	+	!	+	+	+	+	Long Li2014	!	!	+	+	!
Zhengta Yang2018	+	!	+	+	+	+	Jianbing Li2019	!	!	+	+	!
Shengwu Li2016	!	!	+	+	+	!	Xiangxin Li2020	+	!	+	+	+
Huawei Hou2017	+	+	+	+	+	+	Yan Gu2020	+	!	+	+	+
Haotian Pan2022	!	!	+	+	+	!	Jun Wang2021	+	!	+	+	+
Weili Qian2019	!	!	+	+	+	!	Wenkai Zheng2019	!	!	+	+	!
Qiaoyun Shi2019	!	!	+	+	+	!	Jiaying Liu2015	!	!	+	+	!
Hengjie Zhao2023	!	!	+	+	+	!	Haiming Shang2014	+	!	+	+	+
Qiansong He2019	+	!	+	+	+	+	Yaqian Jiang2018	+	!	+	+	+
Aijun Liang2021	!	!	+	+	+	!	Fang Huo2020	+	!	+	+	+
Minghui Li2019	!	!	+	+	+	!	Dundun Zhang2022	!	!	+	+	!
Qirui Cai2021	!	!	+	+	+	!	Guangrong Cen2011	+	!	+	+	+
Rongyan Deng2023	!	!	+	+	+	!	Yuping Tang2019	+	!	+	+	+
Congzhe Zhao2024	!	!	+	+	+	!	Xiao Du2023	+	!	+	+	+
Zhenglin Lu2021	!	!	+	+	+	!	Haibao Wu2024	+	!	+	+	+
Miao He2022	+	!	+	+	+	+	Jiandong Zhang2023	+	!	+	+	+
Qiu Jin2020	+	+	+	+	+	+	Weili Wang2024	+	+	+	+	+
Qiu Jin2022	!	!	+	+	+	!	Jianfeng Tu2024	!	!	+	+	+
Yeyan Wei2022	!	!	+	+	+	!	Bonhyuk Goo2024	+	!	+	+	+
Yanlong Tan2013	!	!	+	+	+	!	Ziling Huang2019	+	!	+	+	+
							Si, L. G.2024	!	!	+	+	!
							Cheng Li2021	!	!	+	+	+
							Xue Zhang2017	!	!	+	+	!

+ Low risk
! Some concerns
- High risk

D1 Randomisation process
 D2 Deviations from the intended interventions
 D3 Missing outcome data
 D4 Measurement of the outcome
 D5 Selection of the reported result

Figure 2 ROB2.0 Evaluation results.

RT: MD = 3.42, 95% CrI [3.06, 3.77]), ES (ES vs RT: MD = 1.65, 95% CrI [1.21, 2.08]), warming needle moxibustion (WA vs RT: MD = 2.29, 95% CrI [1.79, 2.79]), EA combined with CM (EA+CM vs RT: MD = 0.33, 95% CrI [-0.06, 0.72]), MA combined with CP (MA+CP vs RT: MD = 2.65, 95% CrI [2.24, 3.06]), MA combined with CM (MA+CM vs

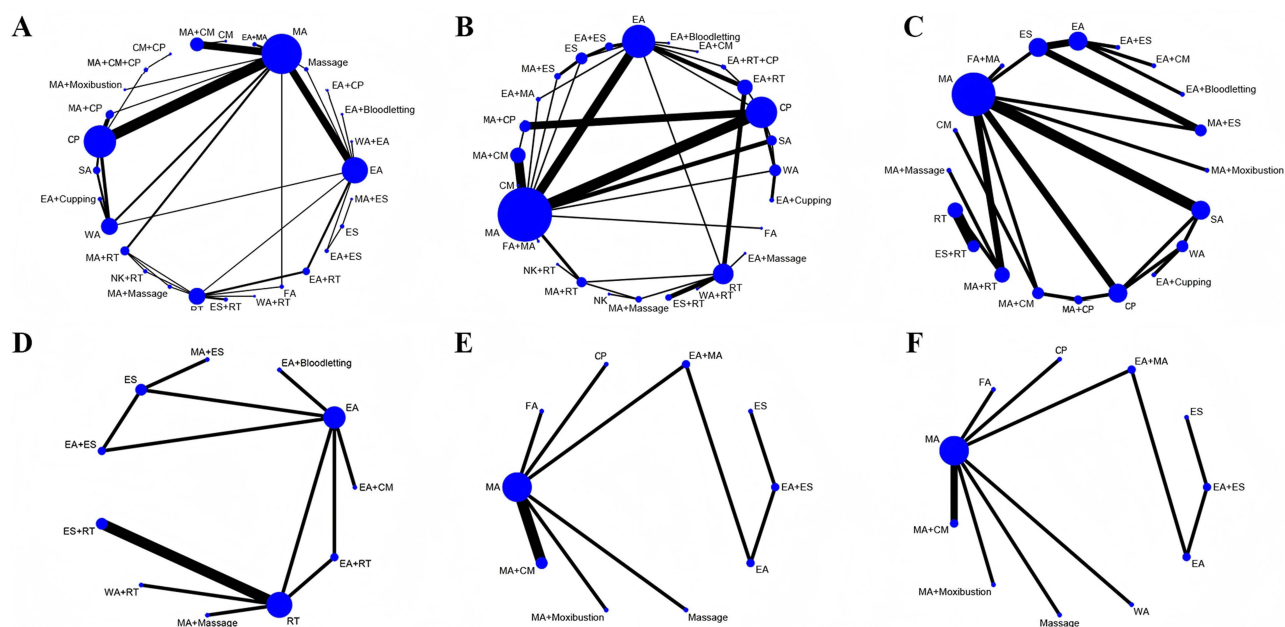


Figure 3 Network plot of meta-analysis. (A) Total effective rate; (B) VAS; (C) ODI; (D) JOA; (E) IL-6; (F) TNF- α .

Abbreviations: MA, Manual acupuncture; EA, Electroacupuncture; SA, Sham acupuncture; CM, Chinese herbal medicine; CP, Conventional pharmaceuticals; RT, Rehabilitation treatment; ES, Electrostimulation; WA, Warm acupuncture; NK, Needle knife; FA, Fire acupuncture.

RT: MD = 0.28, 95% CrI [-0.08, 0.65]), MA combined with ES (MA+ES vs RT: MD = 1.06, 95% CrI [0.59, 1.53]), fire needle therapy (FA vs RT: MD = 0.87, 95% CrI [0.35, 1.37]), EA combined with rehabilitation therapy (EA+RT vs RT: MD = 0.09, 95% CrI [-0.18, 0.36]), EA combined with cupping (EA+Cupping vs RT: MD = 1.34, 95% CrI [0.75, 1.92]), and EA combined with bloodletting (EA+Bloodletting vs RT: MD = 0.65, 95% CrI [0.07, 1.23]). Detailed results are presented in Figure 5A.

According to the SUCRA-based probability ranking, more effective interventions for reducing VAS scores were: NK+RT (95.96%) > WA+RT (94.18%) > FA+MA (90.15%) > EA+Massage (86.89%). NK combined with rehabilitation therapy demonstrated better efficacy in alleviating pain, as shown in Figure 5B.

ODI

27 studies reported outcomes related to the ODI. The NMA revealed that, compared with RT alone, patients with sciatica secondary to LDH showed significant reductions in ODI following ES combined with rehabilitation therapy (ES+RT vs RT: MD = -7.52, 95% CrI [-8.02, -7.02]), MA combined with rehabilitation therapy (MA+RT vs RT: MD = -3.98, 95% CrI [-5.33, -2.63]), and EA combined with cupping (EA+Cupping vs RT: MD = -9.08, 95% CrI [-15.38, -2.80]). In contrast, ODI scores significantly increased after MA (MA vs RT: MD = 12.22, 95% CrI [9.87, 14.60]), EA (EA vs RT: MD = 8.20, 95% CrI [3.90, 12.52]), CM (CM vs RT: MD = 4.60, 95% CrI [1.95, 7.27]), CP (CP vs RT: MD = 16.64, 95% CrI [14.27, 19.03]), ES (ES vs RT: MD = 13.90, 95% CrI [9.94, 17.87]), MA combined with CP (MA+CP vs RT: MD = 10.99, 95% CrI [8.32, 13.66]), MA combined with CM (MA+CM vs RT: MD = 3.61, 95% CrI [1.09, 6.13]), MA combined with massage (MA+Massage vs RT: MD = 4.72, 95% CrI [3.20, 6.24]), MA combined with ES (MA+ES vs RT: MD = 9.39, 95% CrI [5.39, 13.38]), and MA combined with moxibustion (MA+Moxibustion vs RT: MD = 9.66, 95% CrI [6.02, 13.28]). Detailed findings are provided in Figure 6A.

The SUCRA probability ranking demonstrated that more effective interventions for reducing ODI were: EA+Cupping (98.03%) > ES+RT (96.33%) > MA+RT (88.60%) > WA (82.49%), with EA combined with cupping showing the greatest improvement in functional disability. Details are provided in Figure 6B.

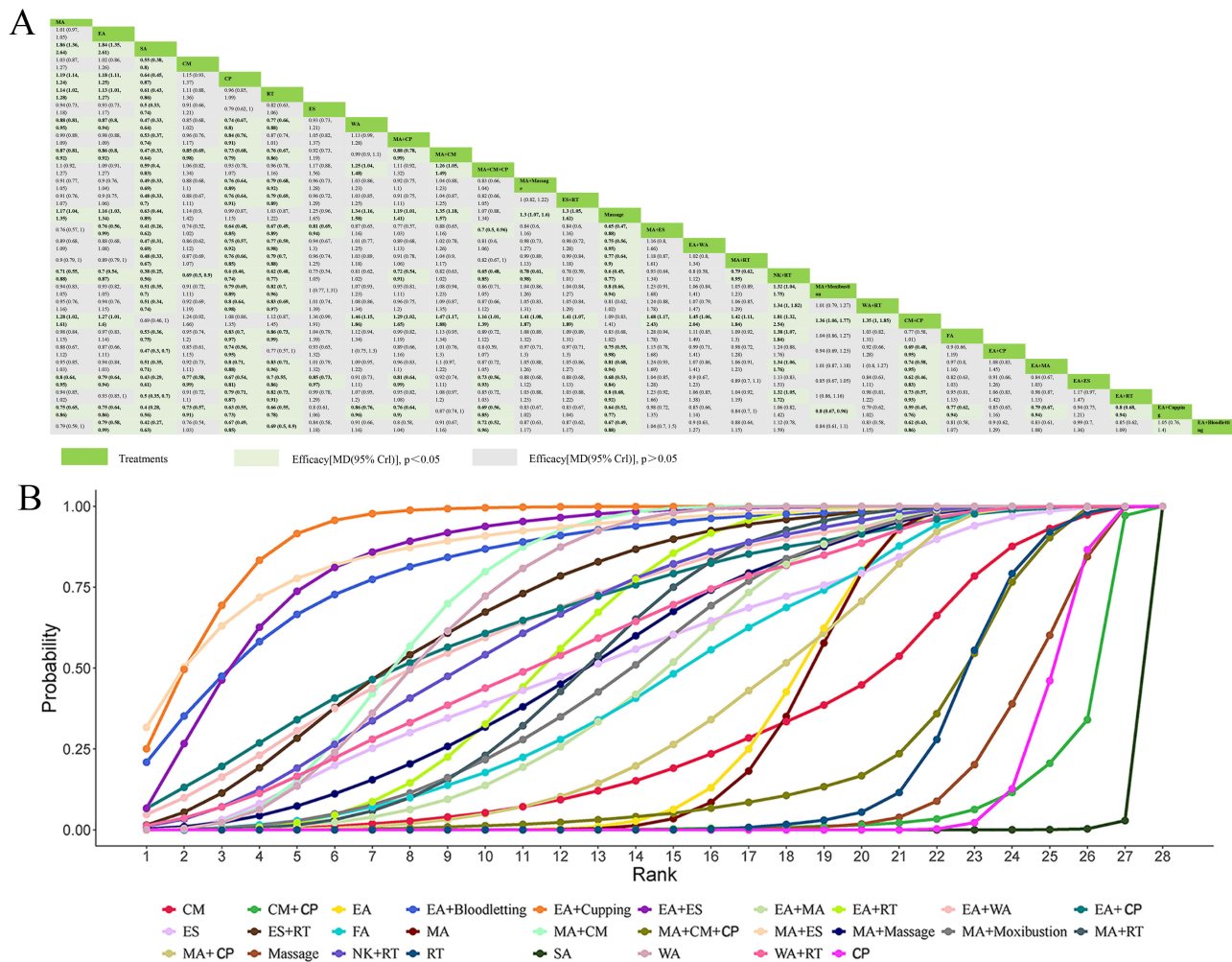


Figure 4 (A) Results of network meta-analysis of Total effective rate; **(B)** Cumulative probability line plot of total effective rate. **Abbreviations:** MA, Manual acupuncture; EA, Electroacupuncture; SA, Sham acupuncture; CM, Chinese herbal medicine; CP, Conventional pharmaceuticals; RT, Rehabilitation treatment; ES, Electrostimulation; WA, Warm acupuncture; NK, Needle knife; FA, Fire acupuncture.

JOA

10 studies reported JOA outcomes. According to the NMA, significant improvements in JOA scores were observed following EA combined with CM (EA+CM vs RT: MD = 4.28, 95% CrI [1.46, 7.10]), MA combined with massage (MA+Massage vs RT: MD = 2.06, 95% CrI [0.19, 3.92]), ES combined with rehabilitation therapy (ES+RT vs RT: MD = 5.16, 95% CrI [4.67, 5.65]), warming needle moxibustion combined with rehabilitation therapy (WA+RT vs RT: MD = 2.81, 95% CrI [0.75, 4.88]), EA combined with ES (EA+ES vs RT: MD = 4.80, 95% CrI [2.07, 7.55]), and EA combined with rehabilitation therapy (EA+RT vs RT: MD = 5.00, 95% CrI [2.26, 7.74]). Full details are presented in **Figure 7A**.

The SUCRA-based ranking indicated the following order of effectiveness in improving JOA scores: ES+RT (88.27%) > EA+RT (85.02%) > EA+ES (84.32%) > EA+CM (74.93%), with ES combined with rehabilitation therapy being a more efficacious treatment, as shown in **Figure 7B**.

IL-6

11 studies reported on IL-6. NMA results revealed that, compared with MA (MA), significant reductions in IL-6 levels were observed in sciatica patients due to LDH following treatment with EA (EA vs MA: MD = -16.85, 95% CrI: -20.69 to -13.04), ES (ES vs MA: MD = -41.17, 95% CrI: -46.36 to -36.01), warm needling (WA vs MA: MD = -0.5, 95% CrI: -0.75 to -0.25), MA combined with CM (MA+CM vs MA: MD = -15.38, 95% CrI: -16.77 to -14), MA combined with moxibustion (MA+Moxibustion vs MA: MD = -3.35, 95% CrI: -5.91 to -0.81), fire needling (FA vs MA: MD =

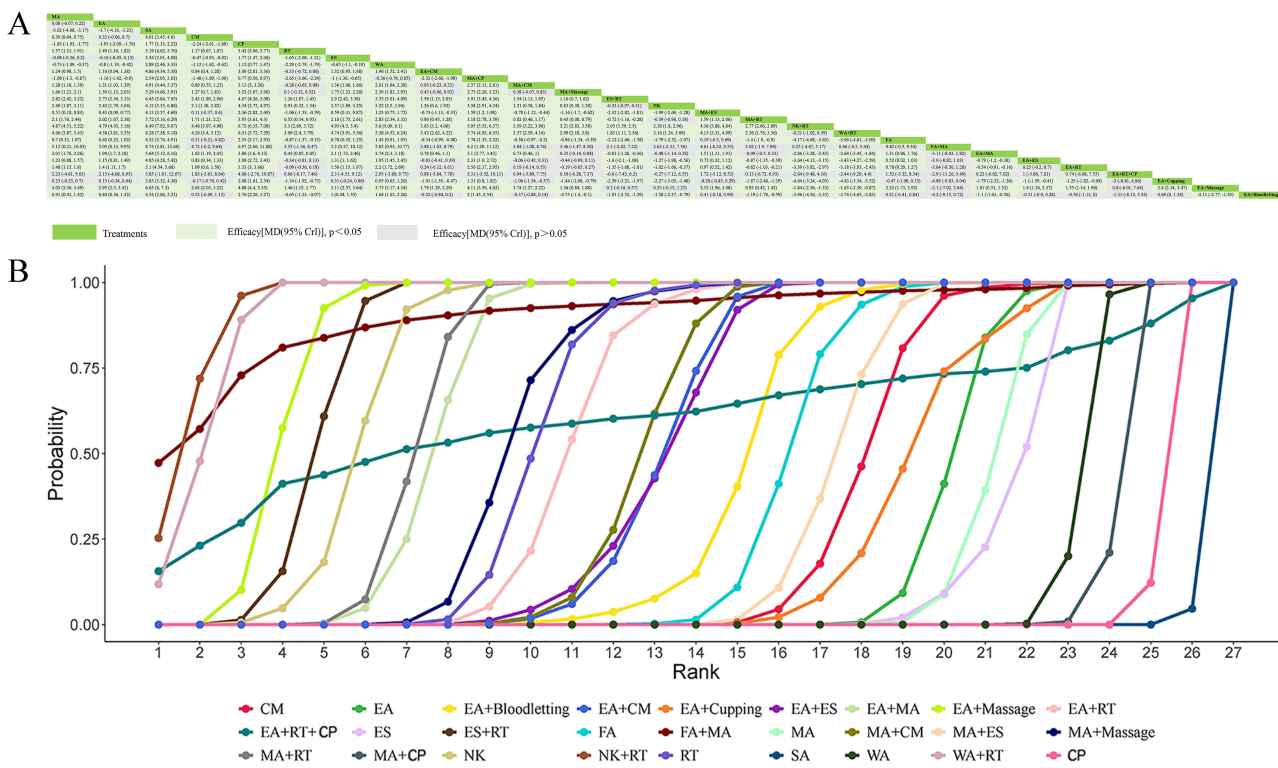


Figure 5 (A) Results of network meta-analysis of VAS; **(B)** Cumulative probability line plot of VAS. **Abbreviations:** MA, Manual acupuncture; EA, Electroacupuncture; SA, Sham acupuncture; CM, Chinese herbal medicine; CP, Conventional pharmaceuticals; RT, Rehabilitation treatment; ES, Electrostimulation; WA, Warm acupuncture; NK, Needle knife; FA, Fire acupuncture.

-0.46, 95% CrI: -0.68 to -0.24), EA combined with MA (EA+MA vs MA: MD = -24.04, 95% CrI: -26.86 to -21.24), and EA combined with ES (EA+ES vs MA: MD = -49.88, 95% CrI: -54.84 to -44.94). In contrast, treatment with CP resulted in a significant increase in IL-6 levels (CP vs MA: MD = 5.99, 95% CrI: 1.61 to 10.37). Detailed results are shown in Figure 8A.

The SUCRA probabilities indicated that EA+ES (99.99%) > ES (90.00%) > EA+MA (80.00%) > EA (67.60%), suggesting that EA combined with ES yielded the greatest reduction in IL-6 levels (Figure 8B).

TNF-α

11 studies provided data on TNF-α. According to the NMA, compared with MA, significant reductions in TNF-α levels were observed following treatment with EA (EA vs MA: MD = -16.85, 95% CrI: -20.69 to -13.04), ES (ES vs MA: MD = -41.20, 95% CrI: -46.34 to -36.02), warm needling (WA vs MA: MD = -0.5, 95% CrI: -0.75 to -0.25), MA combined with CM (MA+CM vs MA: MD = -15.38, 95% CrI: -16.77 to -14), MA combined with moxibustion (MA+Moxibustion vs MA: MD = -3.36, 95% CrI: -5.89 to -0.8), fire needling (FA vs MA: MD = -0.46, 95% CrI: -0.68 to -0.24), EA combined with MA (EA+MA vs MA: MD = -24.03, 95% CrI: -26.88 to -21.21), and EA combined with ES (EA+ES vs MA: MD = -49.90, 95% CrI: -54.82 to -44.96). Conversely, treatment with CP resulted in increased TNF-α levels (CP vs MA: MD = 6.01, 95% CrI: 1.64 to 10.4). The findings are detailed in Figure 9A.

SUCRA rankings indicated the following order: EA+ES (99.99%) > ES (90.00%) > EA+MA (80.00%) > EA (67.61%), with EA combined with ES demonstrating the most pronounced reduction in TNF-α (Figure 9B).

Publication Bias

Publication bias was assessed via comparison-adjusted funnel plots. The symmetrical distribution of the plots indicated no publication bias (Figure 10).

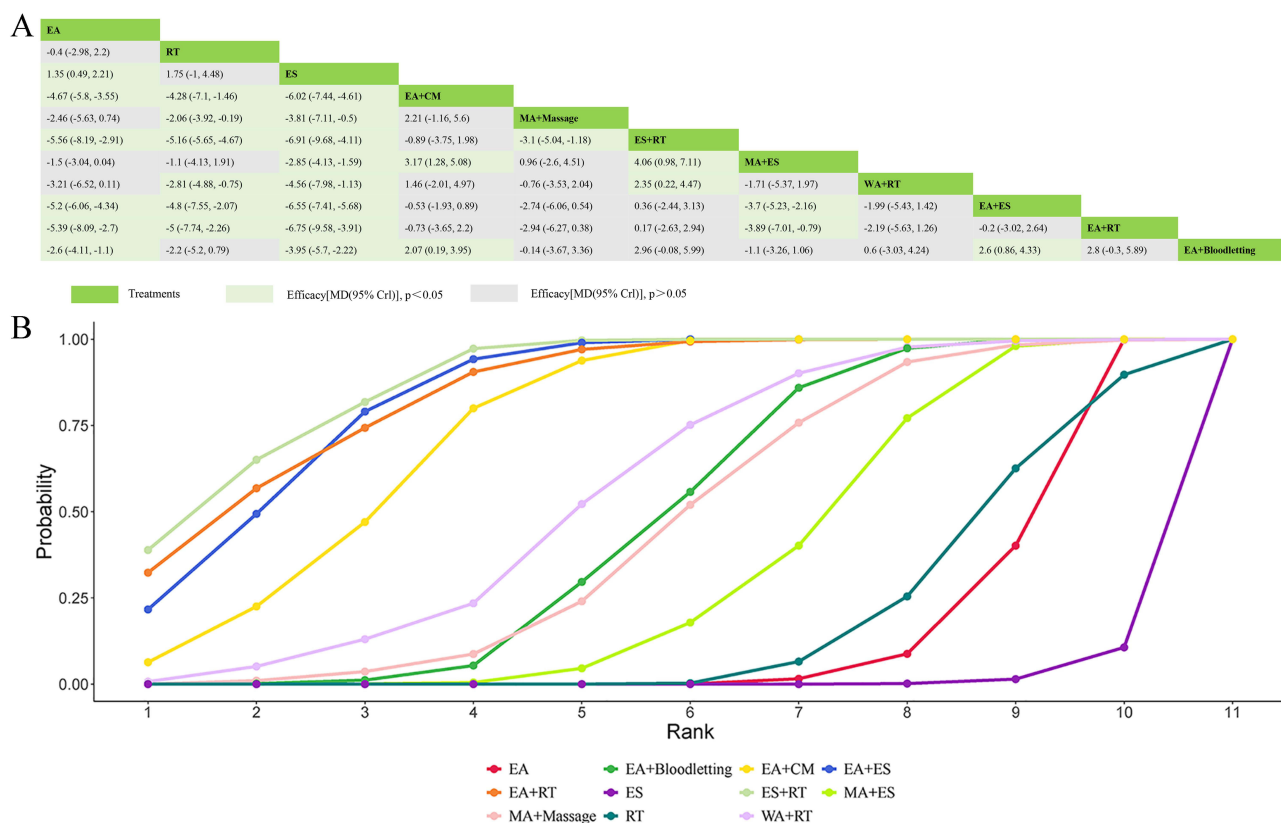


Figure 7 (A) Results of network meta-analysis of JOA; **(B)** Cumulative probability line plot of JOA. **Abbreviations:** MA, Manual acupuncture; EA, Electroacupuncture; CP, Conventional Pharmaceuticals; ES, Electrostimulation; WA, Warm acupuncture; CM, Chinese herbal medicine; FA, Fire acupuncture.

and TNF- α , potentially representing a more effective approach for mitigating localized inflammation. The final results are summarized in Table 2.

Interpretation of Results Pain and Inflammatory Response

Previous studies have demonstrated that nerve root compression and the resulting inflammatory response play a pivotal role in the pathogenesis of sciatica.² Notably, inflammation induced by LDH compressing the lumbosacral nerve roots accounts for approximately 85% of sciatica cases.¹⁰⁸ Therefore, alleviating nerve root compression and mitigating local inflammation are of paramount importance in the therapeutic process. Our study revealed that NK combined with rehabilitation therapy yielded the most significant improvement in VAS scores [NK+RT vs SA: MD = -8.49, 95% CrI (-9.07, -7.92)], suggesting that this combined approach may represent the optimal strategy for pain relief. NK is a therapeutic modality integrating principles of acupuncture with surgical release techniques.¹⁰⁹ The procedure involves the insertion of a needle-knife into the pathological site to perform gentle cutting, dissection, and loosening interventions,^{110,111} thereby eliminating myofascial adhesions, restoring normal biomechanical function, alleviating inflammation and pain, and promoting tissue repair. Compared with other acupuncture-related modalities, NK therapy offers distinct advantages in the treatment of sciatica secondary to LDH. It acts directly on the lesion, facilitating the release of muscular and perilesional tissue tension and relieving nerve root compression caused by the herniated nucleus pulposus. When combined with rehabilitation therapy, NK therapy contributes to the rebalancing of agonist and antagonist muscle groups,⁸¹ thereby achieving more fundamental pain relief and enhanced total effective rate. However, it should be noted that the number of studies included in this analysis involving NK combined with

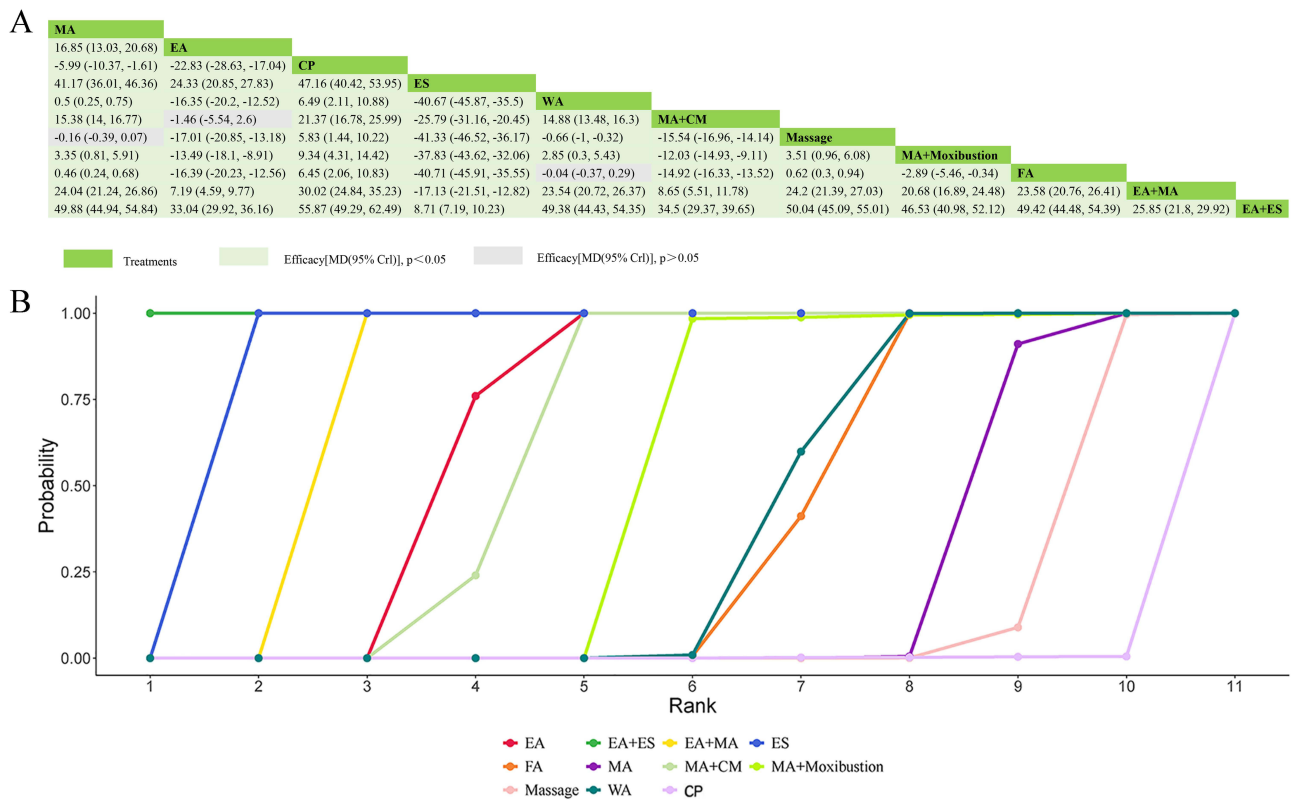


Figure 8 (A) Results of network meta-analysis of IL-6; **(B)** Cumulative probability line plot of IL-6.
Abbreviations: MA, Manual acupuncture; EA, Electroacupuncture; CP, Conventional pharmaceuticals; ES, Electrostimulation; WA, Warm acupuncture; CM, Chinese herbal medicine; FA, Fire acupuncture.

rehabilitation therapy was relatively limited. Due to the small sample sizes, the observed effect sizes may be subject to overestimation, underscoring the need for further high-quality RCTs to validate these findings.

With regard to inflammation, adhesion, edema, and aseptic inflammation around the nerve root induced by LDH are critical contributors to persistent and aggravated pain. IL-6, a key pro-inflammatory cytokine, plays an essential role in inflammation mediation and cellular immunity. TNF- α , another major pro-inflammatory mediator in LDH, is secreted by phagocytes and promotes inflammatory infiltration, tissue damage, and nociceptive hypersensitivity.¹¹² Therefore, changes were assessed in IL-6 and TNF- α levels as indicators of inflammatory improvement. Our results demonstrated that EA combined with ES achieved the greatest reduction in both IL-6 [EA+ES vs MA: MD = -49.88, 95% CrI (-54.84, -44.94)] and TNF- α levels [EA+ES vs MA: MD = -49.9, 95% CrI (-54.82, -44.96)], suggesting that this combined modality may represent a better anti-inflammatory intervention. More evidence supports the anti-inflammatory efficacy of EA.^{113,114} Although the underlying mechanisms have not been fully elucidated, current hypotheses suggest the involvement of both peripheral and central processes. Peripherally, electroacupuncture (EA) may modulate inflammatory mediators and inhibit key signaling pathways within the dorsal root ganglia (DRG). Centrally, it may attenuate neuroinflammatory responses, regulate neuronal excitability, and modulate the expression of opioid peptides and their receptors.¹¹⁵ Furthermore, EA can induce the release of endogenous opioids from lymphocytes, monocytes/macrophages, and granulocytes into inflamed tissues, where they activate peripheral opioid receptors to inhibit nociceptive transmission and thereby alleviate inflammatory pain. Thus, in the context of inflammation, the therapeutic advantage of EA may derive from its capacity to suppress inflammatory responses through multiple pathways. When combined with ES, it may further promote neural repair and enhance the efficacy and durability of treatment outcomes.

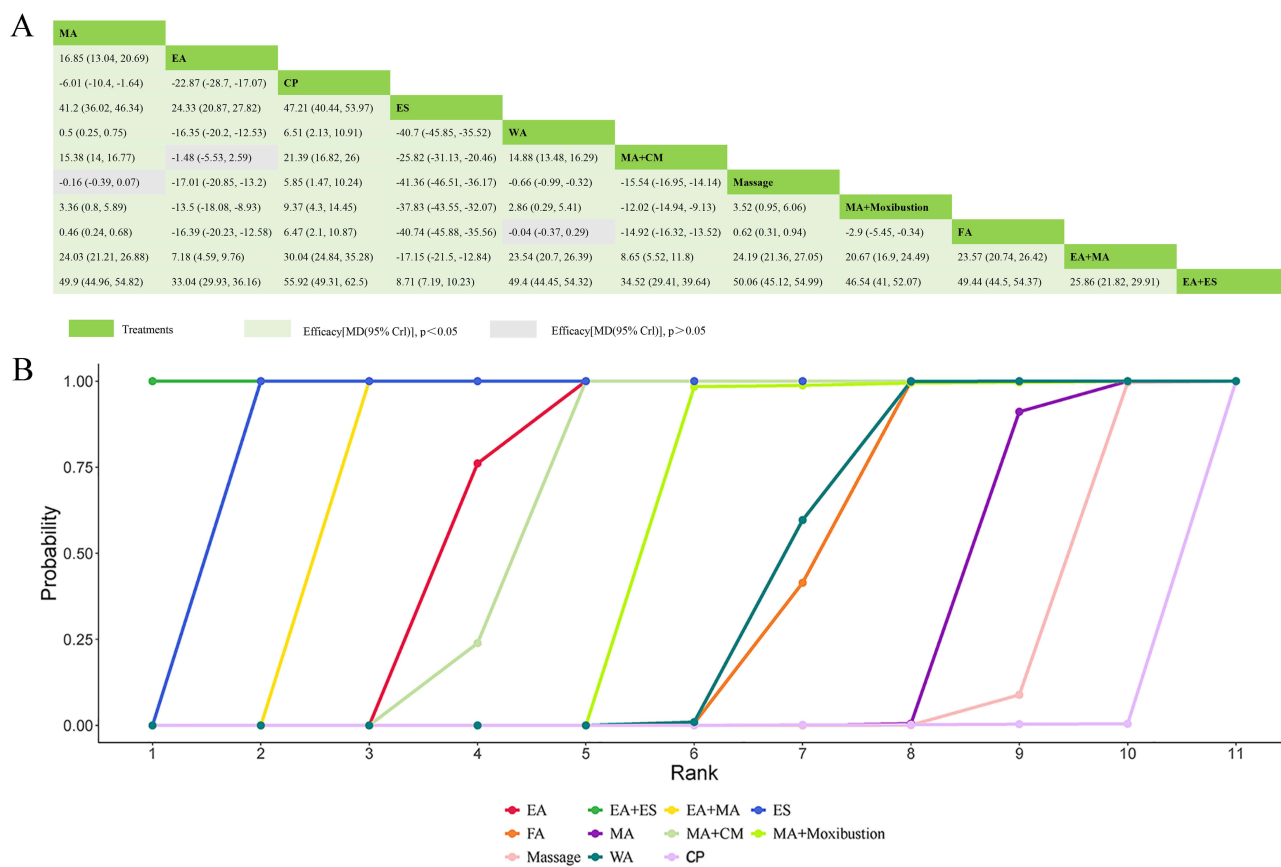


Figure 9 (A) Results of network meta-analysis of TNF- α ; **(B)** Cumulative probability line plot of TNF- α .

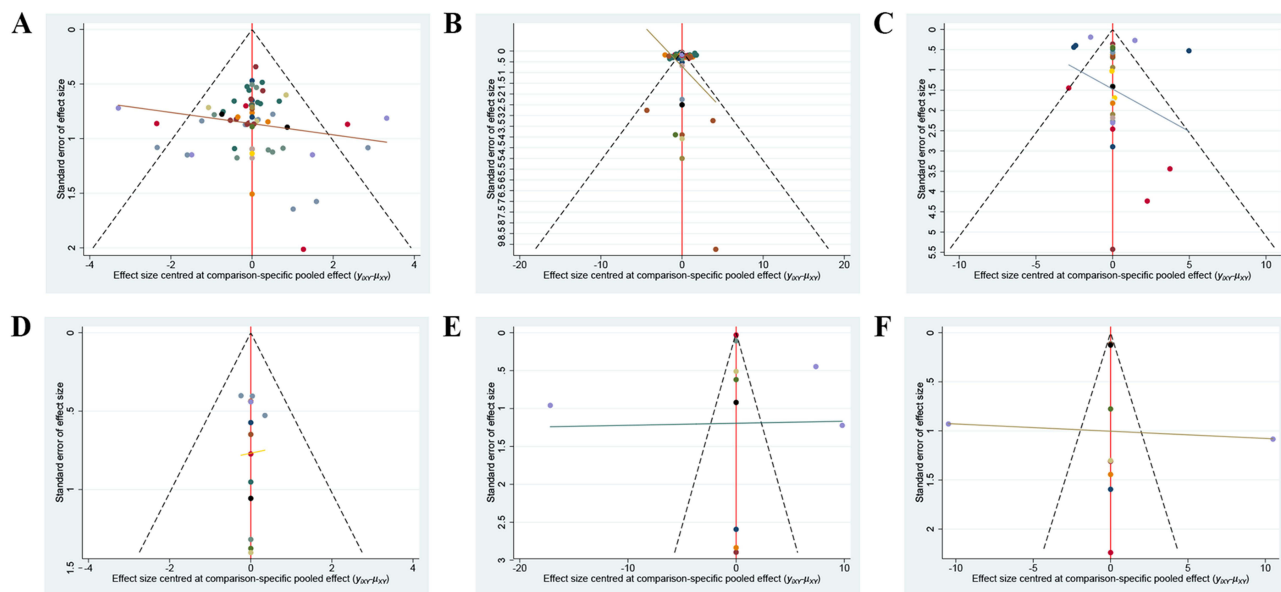


Figure 10 Publication bias analysis funnel plots. **(A)** Total effective rate; **(B)** VAS; **(C)** ODI; **(D)** JOA; **(E)** IL-6; **(F)** TNF- α .

Table 2 Summary of Final Results

Outcome Measure	Recommended Interventions
VAS	NK+RT > WA+RT > FA+MA > EA+Massage
ODI	EA+Cupping > ES+RT > MA+RT > WA
JOA	ES+RT > EA+RT > EA+ES > EA+CM
IL-6	EA+ES > ES > EA+MA > EA
TNF- α	EA+ES > ES > EA+MA > EA
Total effective rate	EA+Cupping > MA+ES > EA+ES > EA+Bloodletting

Abbreviations: MA, Manual acupuncture; EA, Electroacupuncture; CM, Chinese herbal medicine; RT, Rehabilitation treatment; ES, Electrostimulation; WA, Warm acupuncture; NK, Needle knife; FA, Fire acupuncture.

Functional Impairment and Quality of Life

Over time, most sciatica patients experience symptomatic improvement following either conservative or surgical treatment. However, patients suffering from both low back pain and sciatica have a less favorable prognosis compared to those with isolated low back pain. They are more likely to experience exacerbation of pain, functional impairment, disability, diminished quality of life, and increased utilization of healthcare resources.² Accordingly, the extent to which functional impairment is alleviated and quality of life is enhanced during treatment warrants close attention. In the present study, changes in the ODI were used to assess functional impairment and quality of life. The findings revealed that EA combined with cupping therapy produced the greatest reduction in ODI scores [EA+Cupping vs SA: MD = -29.68, 95% CrI = (-35.5, -23.87)], suggesting that this modality is possibly more efficacious in improving function and quality of life. Cupping therapy involves applying negative pressure to affix cups to the trunk or areas adjacent to joints such as the hips, knees, shoulders, and elbows. This traction on the skin and underlying myofascial tissues helps to relax muscle fascia, relieve spasms and pain, and reduce peripheral nerve tension.¹¹⁶ Moreover, when combined with ES, cupping therapy can enhance the muscle pump effect, promoting rhythmic muscular contractions that improve micro-circulation, decrease the accumulation of inflammatory mediators, and ultimately relieve functional impairment and pain.¹¹⁷ Emerging evidence also indicates that cupping therapy may contribute to a calming and comfortable therapeutic environment, thereby promoting relaxation and psychological well-being.¹¹⁸ Such effects may further enhance therapeutic efficacy, improve quality of life, and reduce recurrence rates. The foregoing findings suggest that EA combined with cupping therapy may improve functional impairment and quality of life in patients with sciatica secondary to LDH by simultaneously addressing both physiological and psychological dimensions.

Restoration of Neurological Function

In patients with sciatica caused by LDH, persistent nerve root compression may result in progressive neurological deterioration. Sensory impairments can present as numbness, paresthesia, and hypoesthesia in the lower extremities, while motor dysfunction may manifest as reduced muscle strength, lower limb weakness, and gait instability. In more severe cases involving cauda equina compression, bladder and bowel dysfunction may also occur.¹¹⁹ The JOA score encompasses multiple domains, including motor function, sensory function, and bladder function, and thus provides a comprehensive assessment of neurological status.¹²⁰ In this study, the effects of acupuncture and related therapies on neurological recovery were evaluated by analyzing changes in JOA scores. Interestingly, therapies involving ES demonstrated superior performance in this regard. The top three interventions according to the SUCRA ranking were: ES+RT (88.27%) > EA+RT (85.02%) > EA+ES (84.32%), indicating that ES combined with rehabilitation therapy is possibly a more effective approach for improving JOA scores. More evidence has shown that both invasive and non-invasive ES of injured sciatic nerves can enhance nerve regeneration and accelerate functional recovery.¹²¹ Stimulated areas exhibit upregulation of brain-derived neurotrophic factor (BDNF) and tyrosine receptor kinase B (TrkB), which contribute to reduced sensitivity of the growth cone at the site of injury and facilitate axonal regeneration.¹²²⁻¹²⁴

Furthermore, the application of electric fields during nerve growth has been shown to directly influence neurite branching.^{125,126} Therefore, in patients with sciatica due to LDH, ES therapy is possibly crucial in promoting neurological recovery. When combined with rehabilitation therapy to relieve muscle tension and alleviate nerve root compression, it can collectively improve neurological dysfunction and restore neural function.

Comparison with Previous Systematic Reviews

Previous meta-analyses^{11,12} have reported findings consistent with those of the present study, indicating that acupuncture is more effective than conventional therapy or NSAIDs in treating sciatica secondary to LDH. However, the current study addresses several limitations that were not adequately resolved in earlier analyses. Notably, prior studies primarily demonstrated the superiority of acupuncture monotherapy over standard pharmacological treatments, without further exploring comparative or combination strategies. Nevertheless, acupuncture encompasses a broad array of modalities, each with distinct therapeutic advantages, and is frequently administered in conjunction with conventional pharmaceuticals or rehabilitation therapies in clinical settings. Therefore, comparative analysis across different acupuncture-related interventions holds significant clinical relevance, as it may inform the selection of more effective and safer treatment strategies for patients presenting with complex and heterogeneous clinical manifestations. Furthermore, this study adopted a more comprehensive and multidimensional set of outcome indicators and investigated the potential mechanisms underlying the therapeutic effects of acupuncture on sciatica secondary to LDH. In addition, the literature search was conducted from the inception of each database through February 10, 2025, thereby extending the search timeframe and improving the comprehensiveness of the included studies.

Clinical Implications and Significance

Our study identified more effective interventions for each outcome measure, thereby providing valuable guidance for clinical decision-making to achieve better therapeutic efficacy. Specifically, for analgesia, the combination of NK and rehabilitation therapy was recommended. To improve functional impairment and quality of daily living, EA combined with cupping therapy is advised. For the restoration of neurological function, ES in conjunction with rehabilitation therapy is suggested. To alleviate inflammatory responses, EA combined with ES appears to be more effective. Given the advantages of these interventions, including convenience, safety, minimal adverse effects, and low cost, they warrant broader clinical adoption and application. Despite differences in intervention modalities, a notable consistency was observed in the selection of acupoints. According to our analysis, GB30, BL40, BL25, and BL34 were among the most frequently utilized points, aligning with prior research¹² and commonly recommended acupoints in the treatment of sciatica.¹²⁷ Therefore, GB30, BL40, BL25, and BL34 may represent common and effective acupoint choices in the clinical management of sciatica caused by LDH.

Limitations

This study has several limitations. First, due to the inherent characteristics of acupuncture procedures, blinding of practitioners is exceedingly difficult. Most of the included studies lacked detailed descriptions of blinding methods or allocation concealment, potentially introducing bias into the results. Second, some of the interventions evaluated were supported by only a limited number of studies, resulting in insufficient strength of evidence for certain components of the meta-analysis. Future studies with larger sample sizes and rigorously designed RCTs are warranted to validate these findings. Third, the conclusions of the NMA are based on statistical assumptions involving indirect comparisons. In this study, discrepancies were noted between direct and indirect comparisons for several outcomes, highlighting the need for additional head-to-head randomized trials to confirm these results. Fourth, the included studies did not stratify or analyze key clinical variables such as surgical status, acute versus chronic symptom presentation, or the presence of comorbidities. This lack of stratification may have contributed to substantial clinical heterogeneity and limited the applicability of the findings to clinical practice. Fifth, significant heterogeneity was observed for certain outcomes, which is possibly attributable to differences in acupuncture duration, acupoint selection, and pain localization. Further research is needed to explore the sources of heterogeneity in more detail. Although the findings suggest that acupuncture-based combination therapies are possibly more effective than monotherapies, direct comparisons with first-line Western medical treatments, such as NSAIDs or surgical interventions, remain scarce. Future research should prioritize direct comparisons between acupuncture and conventional therapies to better assess its potential as a first-line treatment option.

Conclusion

Acupuncture combined with other therapeutic modalities appears to be more effective than rehabilitation treatment. In terms of pain relief, NK combined with rehabilitation may represent a more effective treatment. For improving functional impairment and quality of daily life, EA combined with cupping therapy is possibly a more beneficial intervention. To promote neurological function recovery, ES combined with rehabilitation may offer a better therapeutic benefit. For alleviating local inflammatory responses, EA in combination with ES is possibly a more effective approach. However, high heterogeneity was observed in some outcomes, and certain studies exhibited a moderate risk of bias. Thus, further high-quality, rigorously designed RCTs are needed to confirm these findings and to provide stronger clinical evidence supporting the use of acupuncture and related therapies in the treatment of sciatica caused by LDH.

Patient and Public Involvement

It was not appropriate or possible to involve patients or the public in the design, conduct, reporting, or dissemination plans of our research.

Data Sharing Statement

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

Author Contributions

All authors have made substantial contributions to the reported work, whether in the conception, study design, execution, data acquisition, analysis or interpretation, or all of these areas, have participated in drafting, revising or critically reviewing the article, have given final approval of the version to be published, have agreed on the journal to which the article is being submitted and been responsible for all aspects of the work.

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The authors report no conflicts of interest in this work.

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