

Different Acupuncture Treatments for Myofascial Pain Syndrome in Neck or Shoulder: A Network Meta-Analysis Based on Randomized Controlled Trials

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Background: Myofascial Pain Syndrome (MPS) is a prevalent musculoskeletal condition. Acupuncture therapy demonstrates significant advantages due to its unique mechanism of action. However, there are notable discrepancies in the evidence levels among various acupuncture therapies, and direct comparative data between different treatments remain scarce.

Methods: Randomized controlled trials (RCTs) investigating acupuncture therapy for MPS in Neck or shoulder were systematically retrieved from CNKI, Wanfang, VIP, CBM, PubMed, EMBASE, Cochrane Library, and Web of Science up to April 30, 2025. Network Meta-analysis was conducted using Stata 16.0.

Results: This study included 29 RCTs, involving a total of 2424 patients. Thirteen types of interventions were evaluated in the experimental groups: Fu's subcutaneous needling, Internal heat acupuncture, Electroacupuncture, Round-point needle, Needle knife, Moxibustion, Sunken cord, Acupoint injection, Conventional acupuncture + Moxibustion, Conventional acupuncture + Bloodletting, Conventional acupuncture + Traditional Chinese Medicine (TCM), Conventional acupuncture + Tuina, and Conventional acupuncture + Exercise. Regarding the Visual Analog Scale (VAS) scores: The top three therapies based on the Surface Under the Cumulative Ranking Curve (SUCRA) values were Moxibustion (0.84), Internal heat acupuncture (0.84), and Conventional acupuncture + Moxibustion (0.79). In terms of efficacy, based on the SUCRA rankings for both outcome indicators, Internal heat acupuncture was identified as having the best overall effect.

Conclusion: Based on the findings of this study, multiple acupuncture methods exhibit significant advantages over conventional acupuncture. Comprehensive analysis indicates that Internal heat acupuncture has the most favorable therapeutic effect.

Keywords: myofascial pain syndromes, acupuncture, visual analog scale, network meta-analysis

Introduction

Myofascial Pain Syndrome in Neck or shoulder, as a typical manifestation of myofascial pain syndrome (MPS), has shown significant population heterogeneity and social medical burden in its epidemiological characteristics. A cross-sectional study showed that myofascial trigger points (MTpPs) were present in all 224 patients with chronic nonspecific neck pain. The prevalence of trigger points in the near-horizontal fibers of the trapezius muscle was as high as 82.1% (right) and 79% (left), while the active trigger points in the levator scapularis and sandwicularis cerae reached 82.14% and 62.5%, respectively. This suggests that the neck and shoulder muscle group is the core affected area of the disorder.¹ It is notable that changes in modern lifestyle have exacerbated the prevalence of the disease. A systematic review in 2020 indicated that the prevalence of neck pain among long-term smartphone users could reach 55.8% to 89.9%, with myofascial pain syndrome being the most common pathological type. The risk was significantly dose-response to the length of time spent using electronic devices with

the head down every day.² Young people also face severe challenges. An epidemiological study shows that 86.4% of people aged 18–25 have neck and shoulder myofascial trigger points, with women having 164 times higher risk than men, and the number of trigger points is significantly positively correlated with depression and anxiety scale scores.³ The loss of productivity caused by the disease is not to be underestimated in the socio-economic dimension. Data show that patients with chronic neck pain have an average of 23 times more sick leave per year than the general population, with 72% of absenteeism cases attributed to limited neck movement caused by acute attacks of myofascial pain.¹ More notably, cervicoshoulder myofasciitis often affects the outcome of other diseases as comorbidities. Among 2,361 patients with cervicogenic vertigo, 58.5% had Myofascial Pain Syndrome in Neck or shoulder as the underlying cause. Although these patients had less severe vertigo, the proportion of those with anxiety disorders was 18 times that of the standard population.⁴

The current treatment strategies for Myofascial Pain Syndrome in Neck or shoulder are diversified, mainly covering three directions: physical therapy, drug intervention and invasive treatment. In the field of physical therapy, the immediate analgesic effect of transcutaneous electrical nerve stimulation (TENS) as a non-pharmacological intervention has been systematically supported by evidence. For example, a meta-analysis of 381 randomized controlled trials by Johnson et al showed that the intensity of pain during or immediately after TENS treatment was significantly lower than that in the placebo group (SMD = -0.96, moderate-quality evidence), and there was no significant difference in the incidence of adverse reactions compared with the control group.⁵ However, the study also noted that the small sample sizes of most trials led to insufficient accuracy in effect size estimation, and the lack of long-term follow-up data made it difficult to assess the sustained efficacy of TENS. In the field of manual therapy, dry needle therapy and manual therapy are widely used, but their clinical value remains controversial. Barbero's clinical observations further revealed that although manual therapy targeting myofascial trigger points can improve local blood supply and muscle tone, the efficacy usually lasts no more than 72 hours and needs to be combined with Exercise rehabilitation to extend the benefit period. In terms of drug treatment, non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants remain the first-line clinical options, but Galasso's comprehensive study indicates that about 38% of long-term NSAIDs patients have gastrointestinal adverse reactions, and drug dependence is particularly prominent among people with chronic pain.⁶ Although ultrasound-guided local injection therapy has been able to precisely locate the lesion in recent years, Kara's imaging studies showed transient muscle fibrosis changes after injection in about 25% of cases, suggesting that invasive procedures may exacerbate the mechanical stress imbalance of the fascia structure.⁷

In the clinical practice of Myofascial Pain Syndrome in Neck or shoulder, acupuncture therapy has shown significant advantages due to its unique mechanism of action. Compared with traditional treatment, acupuncture can achieve both short-term analgesia and long-term functional improvement through multiple pathways of regulating local microcirculation, inhibiting the release of inflammatory factors, and releasing myofascial trigger points. The research by Guo et al⁸ indicates that MTrPs are somewhat close to the locations of acupuncture points and some overlap. However, the anatomical positioning must be on the muscles (as there is a muscle twitch reaction during acupuncture). Guo et al used the concept of referred pain to locate MTrPs and found that their distribution paths are similar to the course of meridians. They also discovered that if the trigger points are accurately touched or needled, local muscle twitch reactions will occur, that is, local muscle twitching, which will have a very good analgesic effect. For example, a reticular meta-analysis confirmed that gua sha combined with warm acupuncture had a significant advantage in improving pain intensity, while small Needle knife therapy was highly effective in raising the tenderness threshold, and this targeted therapeutic effect made personalized programming possible.⁹ However, the limitations of this therapy are also worth noting. The differences in manipulation techniques among different practitioners may affect the stability of therapeutic effects, especially when it comes to deep myofascial treatment. Meanwhile, the mechanism of acupuncture in treating musculoskeletal pain also includes non-specific mechanisms, such as placebo/situational effects. A meta-analysis has shown that in terms of pain treatment, the effect of acupuncture is superior to that of the placebo.¹⁰

Currently, there are significant differences in the evidence levels of different acupuncture therapies. There is a lack of direct comparison data among different therapies, and traditional meta-analyses are difficult to establish a complete evidence chain. Additionally, the combined therapies commonly used in clinical practice have not yet established an efficacy grading evaluation system, and there is a lack of evidence for comparing the effects of different acupuncture therapies. There is no consensus on the standardization of needle selection and insertion depth, which leads to a significant increase in heterogeneity among clinical studies. Therefore, it is of urgent necessity to conduct a network

meta-analysis on acupuncture therapy for cervical and shoulder myofascial inflammation. This study uses a network meta-analysis to investigate the differences in efficacy among various acupuncture therapies, aiming to identify the most effective acupuncture therapy and provide evidence-based evidence for clinical practice.

Methods

Register

This study was written in accordance with the PRISMA guidelines.¹¹ This study has been prospectively registered with PROSPEO under the number CRD420251040965.

Inclusion Criteria

(1) Study subjects: Patients with myofascial pain syndrome (the study description includes neck or shoulder). Age, gender, duration of the disease, etc. are not restricted. (2) Intervention measures: acupuncture-related therapies (including Internal heat acupuncture, Electroacupuncture, Moxibustion, Acupoint injection, etc.); (3) Control group: Conventional acupuncture. (4) Outcome measure: Efficacy (effective number/total number *100%); Visual Analog Scales(VAS) score: A commonly used subjective tool for assessing pain intensity. The score ranges from 0 to 10, with a lower score indicating less pain. Reporting one outcome measure can be included. (5) Study type: Randomized controlled trial. The language is limited to Chinese and English.

Exclusion Criteria

(1) Duplicate references. (2) Non-randomized controlled trials (reviews, animal trials, abstracts, etc). (3) The intervention measures do not match. (4) Incomplete or incorrect data. (5) Unavailable documentation. (6) Network meta-analysis cannot be formed.

Search Strategy

Randomized controlled trials of acupuncture for Myofascial Pain Syndrome in Neck or shoulder published in PubMed, Web of Science, Embase, Cochrane Library, VIP, SinoMed, CNKI and Wanfang were searched. Using a combination of subject words and free words. The time period is from establishment to April 30, 2025. The search strategy is in the [supplementary materials 1](#).

Literature Screening and Data Extraction

Two researchers independently used Endnote to screen the literature respectively. The study was initially screened by checking for duplicates, reading titles and abstracts, and then re-screened by reading the full text. Data were entered using Excel. Extract ① Basic information: author, journal, region, publication year. ② Baseline data: patient information, intervention measures, course of treatment, outcome indicators. ③ Risk of bias information: randomization method, allocation hiding, blinding, etc. If the data is incomplete, contact the original study authors for detailed data. After completion, check each other, and if there are any issues, discuss and decide within the group.

Quality Evaluation

The quality was evaluated independently by two evaluators using the Cochrane Risk Bias Evaluation Tool, and cross-checked after completion. It included six aspects: random sequence, allocation concealment, blinding, completeness of outcomes, selective reporting of results, and other sources of bias. Each was evaluated as Low risk, High risk, and Unclear. The criteria for judging the quality of the literature were as follows: high grade if all were low risk, medium grade if no high risk but with uncertain risk, and low grade if high risk.

Evaluation of Evidence Quality

We used CINeMA¹² to assess the quality of evidence. CINeMA graded the quality of evidence in six areas, namely intra-study bias, inter-study bias, indirectness, imprecision, heterogeneity, and inconsistency, and the final quality of evidence was classified as high, medium, and Low and very low quality grades.

Statistical Analysis

Literature quality was evaluated using RevMan 5.4 and a literature risk bias map was created. Meta-analysis was performed using Stata 16.0. Binary variables used relative risk (RR), continuous variables used the mean difference (MD), and 95% confidence interval (CI) was calculated. The I² statistic test was used to determine the size of heterogeneity, and when I² < 50%, it indicated no statistical heterogeneity; When I² > 50%, statistical heterogeneity was indicated, and sensitivity analysis was conducted to explore the source of heterogeneity. Plot the network of evidence for each outcome measure. When closed loops appear, perform the inconsistency test. If P > 0.05, use the consistency model for analysis; If P < 0.05, the inconsistencies will be reported and the node splitting method will be used for the inconsistencies test. Sort each outcome measure to obtain the surface under the cumulative ranking (SUCRA). SUCRA is expressed as a percentage, with a higher percentage indicating a better intervention.¹³ When the number of included literature for outcome measures was ≥ 10, a “comparison-correction” funnel plot was plotted and Egger’s test was performed to determine the possibility of publication bias.

Results

Study Selection

A preliminary search yielded 702 relevant articles, 196 duplicate articles were excluded, 466 articles were excluded by reading the title and abstract, and 11 articles were excluded by reading the full text (2 studies had incomplete data and 9 studies did not meet the intervention measures), and ultimately 29 studies were included. Figure 1 shows the screening process diagram.

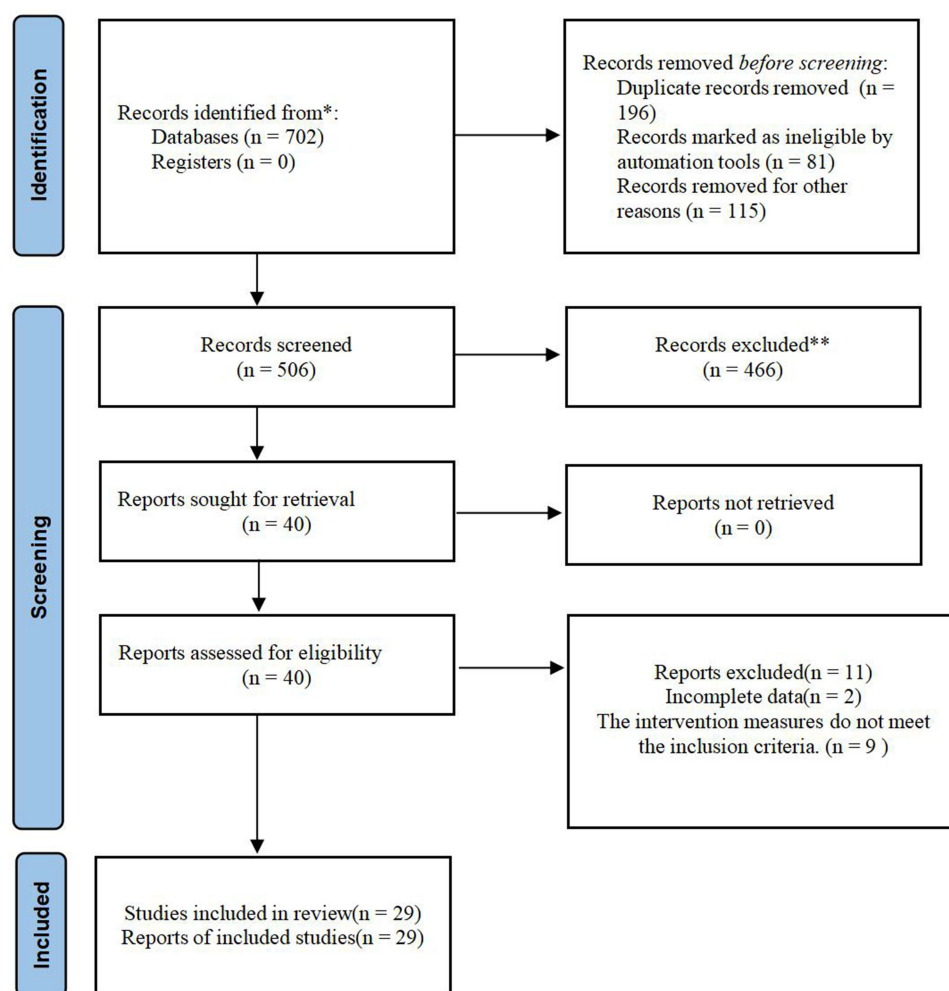


Figure 1 Literature screening process.

Study Characteristics

This study included 29 studies^{14–42} with a total of 2424 patients (1215 in the experimental group and 1209 in the control group). There were a total of 13 interventions in the experimental group: Fu's subcutaneous needling, Internal heat acupuncture, Electroacupuncture, Round-point needle, Needle knife, Moxibustion Youdaoplaceholder0 cord, Acupoint injection, Conventional acupuncture+Moxibustion, Conventional acupuncture+Bloodletting Conventional acupuncture +Traditional Chinese Medicine, Conventional acupuncture+Tuina, Conventional acupuncture+Exercise. The control group was Conventional acupuncture. Table 1 shows the basic characteristics of the included studies.

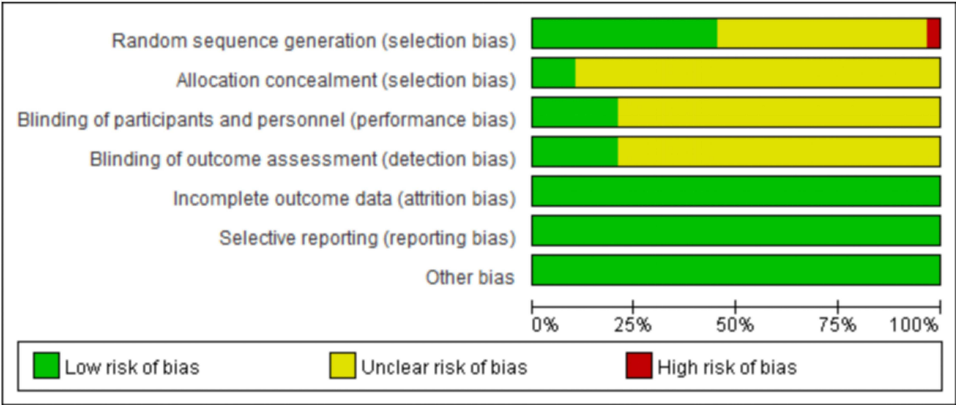
Risk of Bias in Studies

In terms of randomization methods, 25 studies used the low-risk randomization method, and 1 study used the wrong randomization method. In terms of allocation hiding, 13 studies employed a low-risk approach. In terms of blinding (performance bias and detection bias), five studies used blinding. Due to the particularity of acupuncture, blinding was difficult to implement but had little effect on the results. Data from all studies were complete, and no sources of selective reporting and other publication biases were found. Risk of bias results indicated moderate overall quality of the studies. Eight studies were “high risk” (27%), and 21 studies were “medium risk” (73%). Figures 2a and b show the risk of bias results of the included studies.

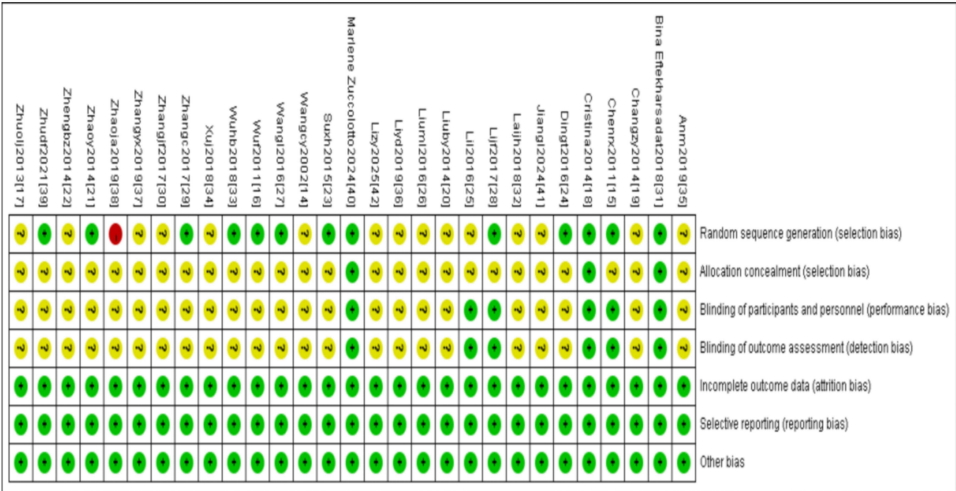
Table 1 Basic Characteristics of the Included Studies

Author	Year	Intervention	Sample size	Age	Time	Outcomes
Wangcy ^[14]	2002	7, I	100, 102	48.15, 47.28	1w	Efficacy
Chenrx ^[15]	2011	8, I	57, 50	46.14±10.58, 44.36±10.51	7w	VAS, Efficacy
Wuf ^[16]	2011	I + 8, I	32, 30	47.26 ± 9.63, 46.94 ± 11.56	1w	VAS, Efficacy
Zhuolj ^[17]	2013	I + 11, I	30, 30	37.5±17.5, 35±17	2w	Efficacy
Cristina ^[18]	2014	3, I	7, 9	30.00 ± 4.80, 26.33 ± 3.81	4w	VAS
Changzy ^[19]	2014	7, I	30, 30	55.34±8.4, 55.77±8.25	2w	Efficacy, VAS
Liuby ^[20]	2014	9, I	65, 65		3w	Efficacy
Zhaoy ^[21]	2014	7, I	58, 58	28.02±4.85, 27.23±4.54	2w	VAS
Zhengbz ^[22]	2014	9, I	65, 65		3w	Efficacy
Suxh ^[23]	2015	2, I	52, 52	41.5±5.5, 43.7±9.5	3w	VAS, Efficacy
Dingt ^[24]	2016	I + 8, I	50, 50	52.28 ± 11.30, 53.08 ± 10.52	2w	VAS, Efficacy
Lil ^[25]	2016	10, I	40, 40	42±13, 43±14	1w	VAS, Efficacy
Liuml ^[26]	2016	4, I	50, 50	35.25±11.65, 34.72±10.5	1w	Efficacy
Wangl ^[27]	2016	8, I	30, 30	40.5±10.5, 40.8±11.4	1w	VAS, Efficacy
Lijf ^[28]	2017	10, I	25, 25	34.9±8.1, 34.2±7.9	1w	VAS, Efficacy
Zhangc ^[29]	2017	7, I	54,	45.56, 42.58	4w	Efficacy
Zhangjf ^[30]	2017	2, I	41, 9	37.27 ± 9.33, 42.80 ± 10.05	3w	VAS, Efficacy
Bina Eftekharsadat ^[31]	2018	14 + I, I	32, 32	33.7±5.8, 23.3±7.0	3w	VAS
Laijh ^[32]	2018	5, I	45,	45.83 ± 12.4, 46.75 ± 12.7	2w	VAS, Efficacy
Wuhb ^[33]	2018	I + 12, I	30, 30	32.45±4.21, 34.16±4.11	1w	VAS, Efficacy
Xuj ^[34]	2018	I + 11, I	60, 60	44.6±7.5, 45.1±7.6	4w	VAS, Efficacy
Anm ^[35]	2019	I + 13, I	50, 50	38.3±2.4, 40.4±3.2	4w	Efficacy
Liyd ^[36]	2019	2, I	30, 30	55.3±6.70, 53.7±7.64	2w	VAS, Efficacy
Zhangyx ^[37]	2019	I + 8, I	30, 30	48.01±4.93, 47.01±5.02	1w	VAS, Efficacy
Zhaoja ^[38]	2019	5, I	30, 30	60.32±1.59, 60.36±1.63	2w	VAS, Efficacy
Zhudf ^[39]	2021	I + 8, I	25, 25	50.76±8.43, 50.32±9.71	2w	VAS
Marlene Zuccolotto ^[40]	2024	3, I	30, 30	39 (32–52), 43 (37–54)	7w	VAS
Jiang ^[41]	2024	8, I	40, 40		4w	VAS, Efficacy
Lizy ^[42]	2025	6, I	27, 26	34.01±9.51, 32.31±8.21	2w	VAS

Notes: I=Conventional acupuncture, 2=Fire acupuncture, 3=Electroacupuncture, 4=Fu's subcutaneous needling 5=Internal heat acupuncture, 6=Round-point needle, 7=Needle knife, 8=Moxibustion, 9=Sunken cord, 10=Acupoint injection 11=Traditional Chinese Medicine, 12=Bloodletting, 13=Tuina, 14=Exercise.



(a) Risk of bias graph



(b) Risk of bias summary

Figure 2 (a) Risk of bias graph (b) Risk of bias summary.

Meta Analysis

Vas

12 studies reported VAS, including 11 acupuncture treatments: Internal heat acupuncture, Acupoint injection, Electroacupuncture, Moxibustion Conventional acupuncture+Traditional Chinese Medicine, Conventional acupuncture +Moxibustion Conventional acupuncture+Exercise, Conventional acupuncture+Bloodletting, Fire acupuncture, Needle knife Round-point needle. There is no closed loop in the figure The inconsistency test results show $P > 0.05$, and the surface network is consistent, analyzed using the consistency model (Figure 3). Heterogeneity test results showed $I^2=5\%$, indicating low heterogeneity. Compared with Conventional acupuncture, Fire acupuncture ($MD=-1.42$, 95% CI $(-2.45, -0.40)$), Internal heat acupuncture ($MD=-2.18$, 95% CI $(-3.37, -0.99)$), Moxibustion ($MD = -2.21$, 95% CI $(-3.46, -0.97)$), but these acupuncture and Moxibustion ($MD = -2.02$, 95% CI $(-3.12, -0.92)$), the effect is good (Figure 4). The therapeutic effects of different acupuncture treatments vary (Table 2). SUCRA sorting the top three in turn is: Moxibustion (0.84), Internal heat acupuncture (0.84), but these acupuncture and Moxibustion (0.79) (Table 3 and Figure 5).

Efficacy

Twenty-three studies reported Efficacy, including 11 acupuncture treatment methods: Internal heat acupuncture, Acupoint injection, Moxibustion, Conventional acupuncture+Traditional Chinese Medicine Conventional acupuncture+Tuina, Conventional acupuncture+Moxibustion, Sunken cord, Fu's subcutaneous needling Conventional acupuncture +Bloodletting, Fire acupuncture, Needle knife. There is no closed loop in the picture. The inconsistency test results

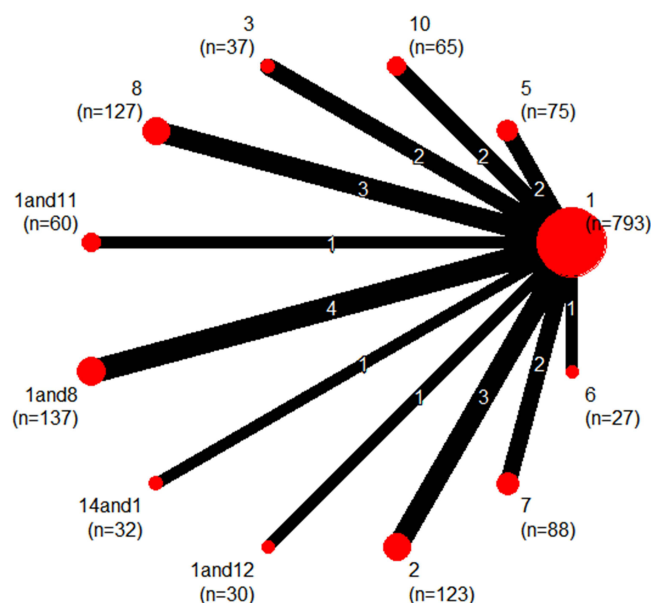


Figure 3 Network Diagram of acupuncture for MPS in Neck or shoulder(VAS).

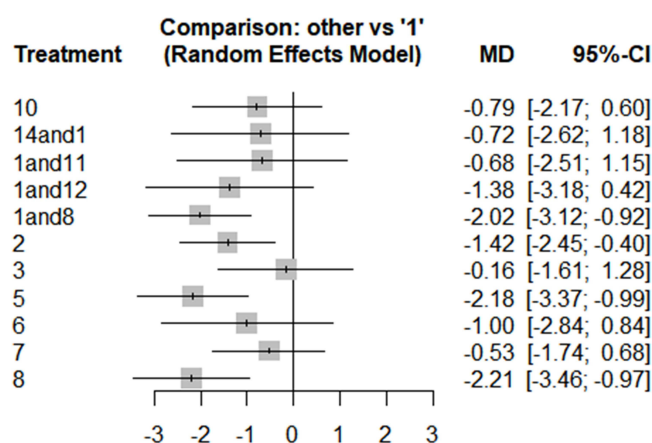


Figure 4 Forest map of acupuncture for MPS in Neck or shoulder(VAS).

show $P > 0.05$, and the surface network is consistent, analyzed using the consistency model (Figure 6). Heterogeneity test results showed $I^2=5\%$, indicating low heterogeneity. Compared with Conventional acupuncture, Acupoint injection ($RR=1.10$, 95% CI (1.00,1.20)), Conventional acupuncture+Traditional Chinese Medicine ($RR=1.15$, 95% CI (1.03,1.29)), acupuncture and Tuina ($RR = 1.31$, 95% CI (1.07,1.61)), acupuncture and Moxibustion ($RR = 1.10$, 95% CI (1.01,1.19)), Fire acupuncture ($RR=1.20$, 95% CI (1.09,1.33)), Fu's subcutaneous needling ($RR=1.20$, 95% CI (1.02,1.41)), Internal heat acupuncture ($RR=1.27$, 95% CI (1.12,1.45)) and Needle knife ($RR=1.12$, 95% CI (1.04,1.19)) worked better (Figure 7). There were differences in the efficacy of different acupuncture (Table 4). The top three SUCRAs in order are Conventional acupuncture+Tuina (0.98), Internal heat acupuncture (0.85), and Fire acupuncture (0.72) (Table 3). Combining the SUCRA results of the two outcome measures, it was found that Internal heat acupuncture had the best combined effect (Table 3 and Figure 5).

Publication Bias Analysis

The Egger test for VAS and Efficacy results showed a low likelihood of publication bias (Egger's $P > 0.05$) (Figure 8a and b).

Table 2 League Table (VAS) Comparing the Effectiveness of Different Acupuncture Treatments for Myofascial Pain Syndrome in Neck or Shoulder

8	8	5	1 and 8	2	1 and 12	6	10	14 and 1	1 and 11	7	3	1
5	-0.03 (-1.76, 1.69)											
1 and 8	-0.19 (-1.85, 1.47)	-0.16 (-1.78, 1.47)	1 and 8									
2	-0.79 (-2.40, 0.83)	-0.76 (-2.33, 0.82)	-0.60 (-2.10, 0.91)	2								
1 and 12	-0.83 (-3.02, 1.35)	-0.80 (-2.96, 1.36)	-0.64 (-2.75, 1.46)	-0.04 (-2.11, 2.03)	1 and 12							
6	-1.21 (-3.43, 1.01)	-1.18 (-3.37, 1.01)	-1.02 (-3.16, 1.12)	-0.42 (-2.53, 1.68)	-0.38 (-2.95, 2.19)	6						
10	-1.42 (-3.29, 0.44)	-1.39 (-3.23, 0.44)	-1.24 (-3.01, 0.54)	-0.64 (-2.36, 1.09)	-0.59 (-2.86, 1.68)	-0.21 (-2.52, 2.09)	10					
14 and 1	-1.49 (-3.76, 0.78)	-1.46 (-3.70, 0.78)	-1.30 (-3.49, 0.89)	-0.70 (-2.86, 1.45)	-0.66 (-3.27, 1.95)	-0.28 (-2.92, 2.36)	-0.07 (-2.42, 2.28)	14 and 1				
1 and 11	-1.53 (-3.74, 0.68)	-1.50 (-3.68, 0.68)	-1.34 (-3.47, 0.79)	-0.74 (-2.84, 1.35)	-0.70 (-3.26, 1.86)	-0.32 (-2.91, 2.27)	-0.11 (-2.40, 2.19)	-0.04 (-2.67, 2.59)	1 and 11			
7	-1.68 (-3.41, 0.06)	-1.65 (-3.35, 0.05)	-1.49 (-3.13, 0.15)	-0.89 (-2.48, 0.70)	-0.85 (-3.01, 1.32)	-0.47 (-2.67, 1.73)	-0.25 (-2.10, 1.59)	-0.19 (-2.44, 2.06)	-0.15 (-2.34, 2.04)	7		
3	-2.05 (-3.96, -0.14)	-2.02 (-3.89, -0.14)	-1.86 (-3.68, -0.04)	-1.26 (-3.03, 0.52)	-1.22 (-3.52, 1.09)	-0.84 (-3.17, 1.50)	-0.62 (-2.63, 1.39)	-0.56 (-2.94, 1.83)	-0.52 (-2.85, 1.82)	-0.37 (-2.26, 1.52)	3	
1	-2.21 (-3.46, -0.97)	-2.18 (-3.37, -0.99)	-2.02 (-3.12, -0.92)	-1.42 (-2.45, -0.40)	-1.38 (-3.18, 0.42)	-1.00 (-2.84, 0.84)	-0.79 (-2.17, 0.60)	-0.72 (-2.62, 1.18)	-0.68 (-2.51, 1.15)	-0.53 (-1.74, 0.68)	-0.16 (-1.61, 1.28)	1

Notes: 1=Conventional acupuncture, 2=Fire acupuncture, 3=Electroacupuncture, 5=Internal heat acupuncture, 6=Round-point needle, 7=Needle knife, 8=Moxibustion, 10=Acupoint injection, 11=Traditional Chinese Medicine, 12=Bloodletting, 14=Exercise.

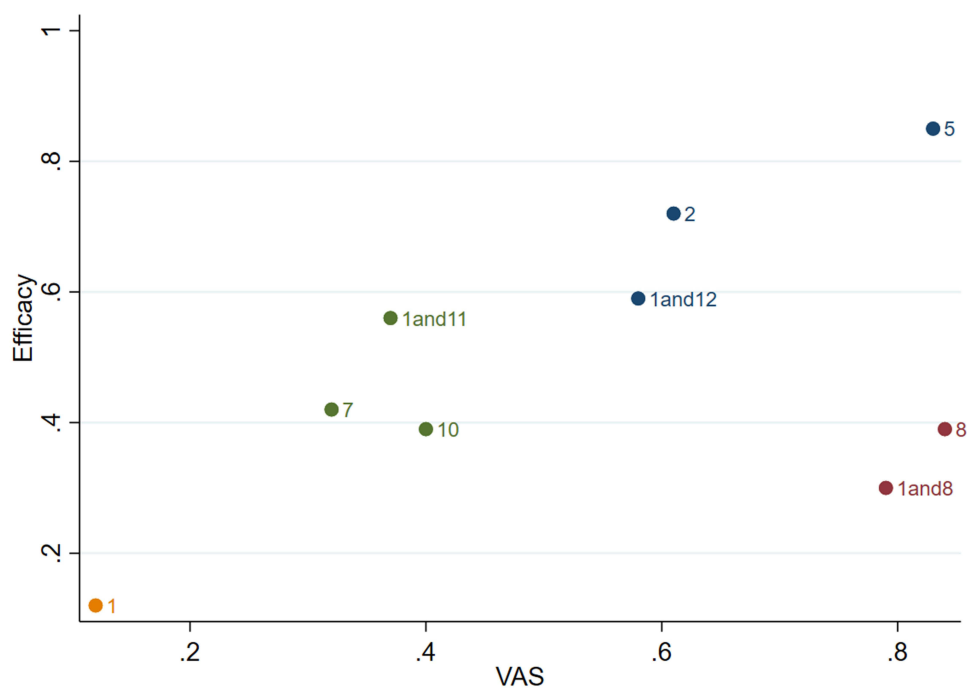
Table 3 SUCRA Sort Results

Intervention	VAS		Intervention	Efficacy	
	SUCRA	No		SUCRA	No
8	0.84	1	1 and 13	0.98	1
5	0.83	2	5	0.85	2
1 and 8	0.79	3	2	0.72	3
2	0.61	4	4	0.61	4
1 and 12	0.58	5	1 and 12	0.59	5
6	0.47	6	1 and 11	0.56	6
10	0.40	7	7	0.42	7
1 and 14	0.39	8	10	0.39	8
1 and 11	0.37	9	1 and 8	0.30	9
7	0.32	10	8	0.27	10
3	0.21	11	9	0.14	11
1	0.12		1	0.12	12

Notes: 1=Conventional acupuncture, 2=Fire acupuncture, 3=Electroacupuncture, 4=Fu's subcutaneous needling 5=Internal heat acupuncture, 6=Round-point needle, 7=Needle knife, 8=Moxibustion, 9=Sunken cord, 10=Acupoint injection 11=Traditional Chinese Medicine, 12=Bloodletting, 13=Tuina, 14=Exercise.

Evaluation of Evidence Quality

The results of each acupuncture method compared with conventional acupuncture showed a lower quality of evidence. The downgrading was mainly due to selective reporting and imprecision ([Supplementary Material 2](#)).

**Figure 5** The comprehensive ranking result of SUCRA.

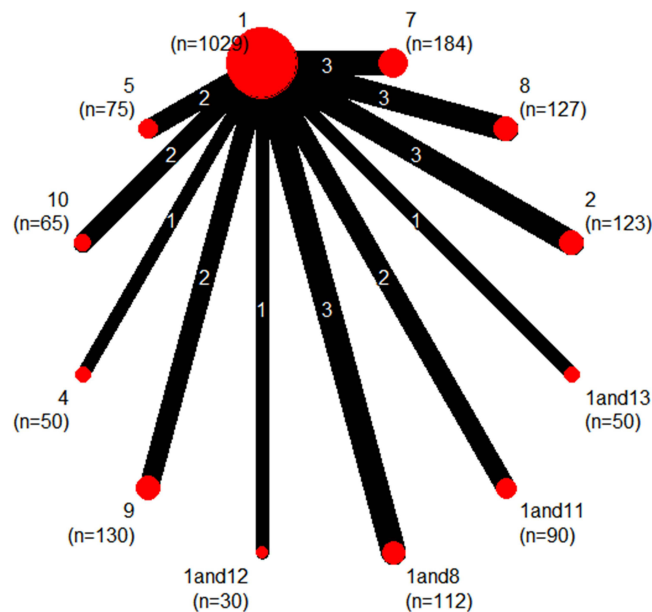


Figure 6 Network diagram of acupuncture for MPS in Neck or shoulder(Efficacy).

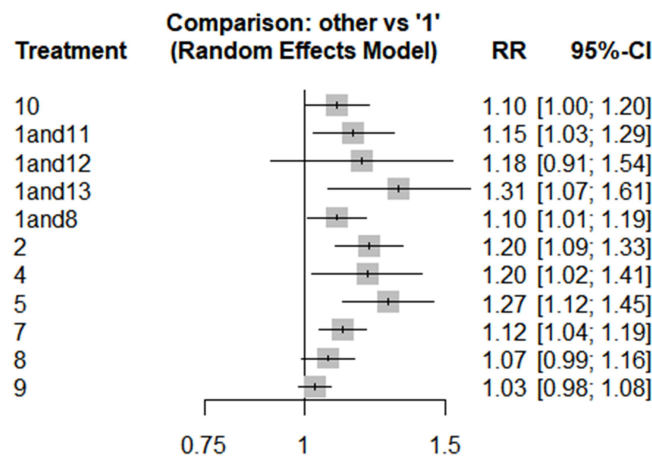


Figure 7 Forest map of acupuncture for MPS in Neck or shoulder(Efficacy).

Discussion

This study employed a meta-analysis approach to evaluate the effectiveness of various acupuncture methods in treating Myofascial Pain Syndrome in Neck or shoulder. A total of 29 studies were included, involving 2,424 patients (1,215 in the experimental group and 1,209 in the control group). The experimental group received 13 different interventions: Fu’s subcutaneous needling, Internal heat acupuncture, Electroacupuncture, Round-point needle, Needle knife, Moxibustion, Acupoint injection, Conventional acupuncture + Moxibustion, Conventional acupuncture + Bloodletting, Conventional acupuncture + Traditional Chinese Medicine, Conventional acupuncture + Tuina, and Conventional acupuncture + Exercise. The control group received Conventional acupuncture. VAS and efficacy rates were used as primary outcome measures for assessing pain-related symptom improvement in patients with Myofascial Pain Syndrome in Neck or shoulder. In terms of VAS scores, the meta-analysis results indicated that Fire acupuncture, Internal heat acupuncture, Moxibustion, and Conventional acupuncture + Moxibustion demonstrated superior effects compared to Conventional acupuncture alone. The SUCRA ranking revealed that Moxibustion (SUCRA = 0.84) was the most effective intervention. Regarding efficacy rates, the meta-analysis showed that Acupoint injection, Conventional acupuncture + Traditional

Table 4 League Table (Efficacy) Comparing the Effectiveness of Different Acupuncture Treatments for Myofascial Pain Syndrome in Neck or Shoulder

I	I	9	8	I and 8	7	I and II	I and II	I and II	4	2	5	I and 13
9	0.97 (0.92, 1.02)	9	8	I and 8	7	I and II	I and II	I and II	4	2	5	I and 13
8	0.93 (0.86, 1.01)	0.96 (0.88, 1.06)	8	I and 8	7	I and II	I and II	I and II	4	2	5	I and 13
I and 8	0.91 (0.84, 0.99)	0.94 (0.85, 1.04)	0.98 (0.87, 1.10)	I and 8	7	I and II	I and II	I and II	4	2	5	I and 13
10	0.91 (0.83, 1.00)	0.94 (0.85, 1.04)	0.98 (0.86, 1.10)	1.00 (0.88, 1.13)	7	I and II	I and II	I and II	4	2	5	I and 13
7	0.90 (0.84, 0.96)	0.92 (0.85, 1.00)	0.96 (0.87, 1.06)	0.98 (0.88, 1.10)	7	I and II	I and II	I and II	4	2	5	I and 13
I and II	0.87 (0.77, 0.98)	0.90 (0.79, 1.02)	0.93 (0.81, 1.07)	0.95 (0.83, 1.10)	0.97 (0.85, 1.11)	I and II	I and II	I and II	4	2	5	I and 13
I and 12	0.85 (0.65, 1.10)	0.87 (0.67, 1.14)	0.91 (0.69, 1.19)	0.93 (0.70, 1.22)	0.94 (0.72, 1.24)	0.97 (0.73, 1.30)	I and 12	I and II	4	2	5	I and 13
4	0.83 (0.71, 0.98)	0.86 (0.73, 1.01)	0.89 (0.75, 1.07)	0.91 (0.76, 1.09)	0.93 (0.78, 1.11)	0.96 (0.79, 1.17)	0.98 (0.72, 1.34)	4	2	5	I and 13	
2	0.83 (0.75, 0.92)	0.86 (0.77, 0.96)	0.89 (0.78, 1.01)	0.91 (0.80, 1.04)	0.93 (0.82, 1.04)	0.96 (0.82, 1.11)	0.98 (0.74, 1.30)	1.00 (0.83, 1.20)	2	5	I and 13	
5	0.78 (0.69, 0.89)	0.81 (0.70, 0.93)	0.84 (0.72, 0.98)	0.86 (0.74, 1.01)	0.88 (0.76, 1.01)	0.90 (0.76, 1.08)	0.93 (0.69, 1.24)	0.94 (0.77, 1.16)	0.95 (0.80, 1.11)	5	I and 13	
I and 13	0.76 (0.62, 0.93)	0.78 (0.64, 0.97)	0.82 (0.65, 1.02)	0.84 (0.67, 1.04)	0.85 (0.68, 1.05)	0.88 (0.69, 1.11)	0.90 (0.64, 1.26)	0.91 (0.70, 1.18)	0.92 (0.73, 1.15)	0.97 (0.76, 1.24)	I and 13	

Notes: I=Conventional acupuncture, 2=Fire acupuncture, 4=Fu's subcutaneous needling, 5=Internal heat acupuncture, 7=Needle knife, 8=Moxibustion, 9=Sunken cord, 10=Acupoint injection, 11=Traditional Chinese Medicine, 12=Bloodletting, 13=Tuina.

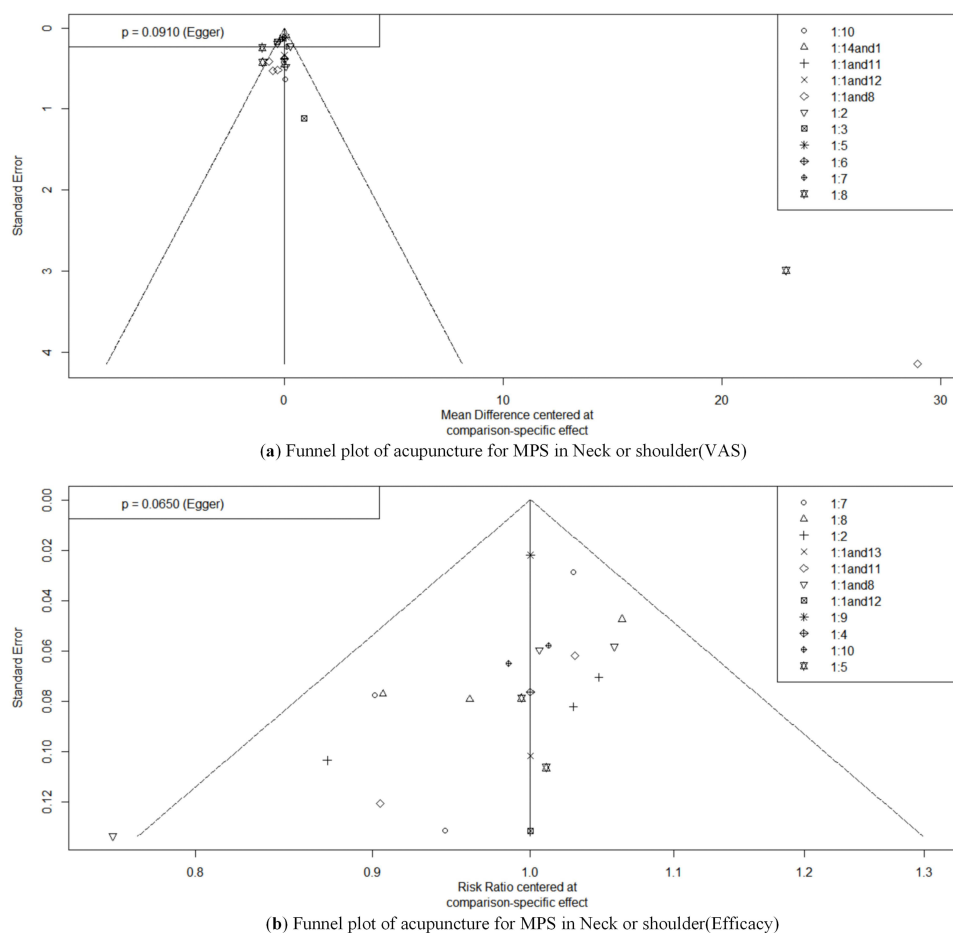


Figure 8 (a) Funnel plot of acupuncture for MPS in Neck or shoulder(VAS) (b) Funnel plot of acupuncture for MPS in Neck or shoulder(Efficacy).

Chinese Medicine, Conventional acupuncture + Tuina, Conventional acupuncture + Moxibustion, Fire acupuncture, Fu's subcutaneous needling, Internal heat acupuncture, and Needle knife all exhibited better outcomes than Conventional acupuncture. The SUCRA ranking identified Conventional acupuncture + Tuina as the best intervention in this category. The results were stable, with no significant publication bias observed. A comprehensive analysis of the SUCRA rankings indicated that Internal heat acupuncture had the overall best therapeutic effect.

Internal heat acupuncture is a novel therapeutic method that combines traditional warm acupuncture techniques, such as silver needles, with modern technology. The procedure involves connecting the resistance wire at the tail of the Internal heat acupuncture needle to an Internal heat acupuncture treatment device. The needle is then inserted into the tender points of the affected soft tissue, and the device is activated to heat the needle, delivering continuous and steady heat deep into the tissue. This process enhances local microcirculation, alleviates inflammatory responses, and accelerates lesion repair.⁴³ Patients with long-standing Myofascial Pain Syndrome in Neck or shoulder, characterized by palpable hard nodules or cords in the affected area, typically exhibit slower responses to treatment, are prone to recurrence, and are more challenging to manage.⁴⁴ In contrast, Internal heat acupuncture passively releases soft tissue lesions caused by Myofascial Pain Syndrome in Neck or shoulder, particularly those with prominent tenderness, palpable hard nodules, or cords. It reduces local fascial pressure, improves blood circulation, increases interstitial oxygen partial pressure, and eliminates local inflammatory edema, thereby promoting tissue repair and achieving remarkable therapeutic effects with a low recurrence rate.

Multiple basic and clinical studies have demonstrated that Internal heat acupuncture is significantly more effective than conventional acupuncture. The mechanisms underlying Internal heat acupuncture include the following: (1) Muscle spasm relief and tension reduction. Internal heat acupuncture treats soft tissue injuries through puncturing, where the

micro-trauma induced by the puncture shortens muscle contraction after chronic injury and alleviates it, improving high tissue tension in the acupuncture area. Animal experiments⁴⁵ have shown that using an Internal heat acupuncture needle with a diameter of 1.1 mm to treat soft tissue injuries at 42°C with a needle spacing of 1.0 cm resulted in significantly less inflammatory edema compared to untreated controls. This may be attributed to the heat energy delivered deep into the muscle via Internal heat acupuncture, reducing γ -neuron excitability and weakening α -motor neuron efferent impulses through negative feedback, thereby decreasing muscle and fibrous tissue tension.⁴⁶ (2) Reduction of inflammatory responses and alleviation of local pain in soft tissue and muscle tissue damage. Yang Zhili et al⁴⁷ found through animal experiments that Internal heat acupuncture treatment reduced malondialdehyde (MDA) levels in the muscles of rats with chronic skeletal muscle injuries while increasing superoxide dismutase (SOD) activity. This suggests that Internal heat acupuncture can mitigate inflammatory responses after chronic soft tissue muscle injuries, enhance antioxidant capacity in injured muscles, and relieve pain. (3) Promotion of angiogenesis and improvement of blood circulation. Internal heat acupuncture significantly increases vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (BFGF) activity in chronically injured rat skeletal muscle and nerve tissues, promoting angiogenesis and enhancing local blood circulation.⁴⁸ (4) Facilitation of muscle repair and restoration of bodily functions. Internal heat acupuncture markedly affects vimentin and albumin expression in the muscle tissue of animals with soft tissue injuries, playing a critical role in muscle repair.⁴⁹ (5) Nourishment of peripheral nerves and promotion of wound healing. Internal heat acupuncture achieves the shortest recovery time for peroneal nerve function in cases of tissue injury, indicating its effectiveness not only in treating soft tissue injuries but also in promoting peripheral nerve injury healing.⁵⁰

Internal heat acupuncture demonstrates efficacy in treating chronic soft tissue injury-induced pain. For instance, Wang et al⁵¹ randomly divided 60 patients into an experimental group and a control group, evaluating therapeutic effects using the visual analog scale (VAS) and clinical efficacy. The total Efficacy of the Internal heat acupuncture group was significantly higher than that of the control group. In terms of short-term and long-term efficacy tracking, Zhang Zhaowen et al⁵² assessed efficacy at the end of treatment, 1 month, and 3 months post-treatment. The total Efficacy of the Internal heat acupuncture group was 92.9%, higher than the 75.9% of the Electroacupuncture group. The Internal heat acupuncture group maintained higher efficacy rates than the Electroacupuncture group during 1-month and 3-month follow-ups. Zhang Ding⁵³ divided 26 patients with periarthritis of the shoulder into a treatment group and a control group, administering Internal heat acupuncture and conventional acupuncture, respectively. Results showed that the total Efficacy of the treatment group was significantly higher than that of the control group, with significantly lower VAS scores, demonstrating a marked effect in reducing patient pain. In terms of long-term efficacy, Ding et al⁵⁴ treated 60 cases of periarthritis of the shoulder in groups, revealing that the total clinical Efficacy of the observation group was better than that of the control group in the second and third weeks post-treatment. Wang Rong⁵⁵ selected 48 patients with lumbar intervertebral disc protrusion, randomly dividing them into Internal heat acupuncture and Electroacupuncture groups. Retrospective analysis of changes in lumbar JOA score, VAS score, and LFR after treatment showed that the total Efficacy of Internal heat acupuncture at the lumbar intervertebral point was significantly higher than that of Electroacupuncture. Internal heat acupuncture offers advantages such as minimal trauma, rapid recovery, green safety, and low cost, with significant and lasting therapeutic effects, making it worthy of promotion.

Luo et al's⁵⁶ meta-analysis compared the effects of different acupuncture therapies on MPS, and the results showed that electroacupuncture was the most effective in improving pain. However, it did not include Internal heat acupuncture. Our research proved that Internal heat acupuncture was more effective than electroacupuncture. Ge's study⁵⁷ was a network meta-analysis of different acupuncture treatments for myofascial pain in the lumbar and dorsal muscles, and the probability of acupuncture thread embedding being the best therapy was the highest. Our research included myofascial pain syndrome in the neck and shoulders, and no relevant studies on acupuncture thread embedding were found. We will closely follow related research in the future and hope to obtain more evidence.

The range of motion of the neck and shoulders is an important indicator. However, many studies have not reported this indicator separately, making it impossible to conduct a meta-analysis. Many studies have included the range of motion in the category of "efficacy". Currently, there is evidence that acupuncture can improve the range of motion of the neck and shoulders. For instance, Zhan's study⁵⁸ randomly assigned 9090 patients with myofascial pain syndrome of the neck and shoulders to receive acupuncture treatment. The study observed the range of functional limitation, muscle spasm, and cervical range of motion before and after treatment. The results showed that acupuncture could significantly

improve the clinical symptoms and signs of patients with myofascial pain syndrome of the neck and shoulders and increase the range of motion of the shoulder and neck joints. Future research should pay more attention to the range of motion of the neck and shoulders and provide more evidence. In addition, patient satisfaction should also be regarded as an important indicator. However, many studies have not reported this indicator separately, making it impossible to conduct a meta-analysis. Currently, there is evidence of patient satisfaction. For example, Wang's study⁵⁹ found that the acupuncture group combined with nursing had a higher satisfaction rate. Currently, acupuncture is accepted and adopted to varying degrees as a method of pain management in different cultures and medical systems around the world. Over the past 20 years, with the continuous accumulation of evidence supporting its efficacy, acupuncture has gradually become a popular choice for treating pain in rehabilitation patients. For instance, an article published by the Canadian Physiotherapy Association emphasized the important role of acupuncture in relieving pain and advocated for the inclusion of pain-related knowledge and treatment methods in physiotherapy professional education to improve treatment efficacy and patient satisfaction.⁶⁰ Future research should place more emphasis on studies related to humanistic care and provide more evidence.

We conducted a systematic analysis of the differences in the effects of different acupuncture therapies for MPS in the neck and shoulders and found that Internal heat acupuncture was effective, providing additional evidence for clinical research. However, There are certain limitations in this study: (1) The quality of the evidence from the included literature is relatively low, potentially reducing result credibility; (2) The included literature has average quality, with most lacking large sample sizes, high-quality, multicenter randomized controlled trials; (3) Efficacy criteria across studies were inconsistent, with varying grades of efficacy, determination standards, operation methods, and treatment durations, which may impact results and increase heterogeneity among studies; (4) A considerable number of studies did not specify randomization methods, allocation concealment, or blinding procedures, resulting in lower quality evaluations; (5) Outcome indicators in the included studies were predominantly subjective, lacking authoritative and scientific metrics to validate result reliability and reduce heterogeneity. These factors may influence results and lead to greater heterogeneity among studies. (4) The quality of evidence results show that the confidence interval of the estimated effect is wide, indicating imprecision. This may be due to the significant differences among the included studies. The included studies have significant differences in terms of population, intervention measures, and outcome measurements. For example, different acupuncture operation techniques (needle depth, retention time); inconsistent pain assessment tools; and differences in the design of the control group. Some studies did not mention or only mentioned the randomization method without specifying the specific operation, did not explain the allocation concealment method and blinding, and had a low quality evaluation, all of which may affect the estimated effect. (5) The outcome indicators of the included studies are mostly subjective indicators, lacking authoritative and scientific indicators to verify the reliability of the results, and there is a possibility of selective reporting. These factors may affect the results and even lead to significant heterogeneity among studies. Although we reduced the risk of publication bias by searching seven major databases, the funnel plot and Egger's test confirmed no significant publication bias. In addition, we extracted the pre-specified primary outcomes of all included studies and found no evidence of selective reporting. However, the conclusions of this study still need to be further verified by high-quality, multi-center, and scientifically based RCT studies.

Conclusions

Based on the existing evidence mainly from Chinese studies, various acupuncture methods have significant advantages compared to conventional acupuncture. Comprehensive analysis shows that Internal Heat Acupuncture has the best effect. The current conclusion is mainly applicable to the Chinese (or similar background) population. Its promotion to other races or regions requires caution and needs further research to confirm. Future research should prioritize the design and implementation of high-quality, large-sample, multi-center, multi-ethnic/population randomized controlled trials to verify the efficacy and safety of acupuncture therapy in different populations, and assess the possible impacts of culture and race factors, so as to obtain more universal and persuasive evidence-based evidence. We will also actively follow and incorporate future published international studies that meet the standards.

Abbreviations

(MPS), Myofascial Pain Syndrome; (RCTs), Randomized controlled trials; (TCM), Traditional Chinese Medicine; (SUCRA), Cumulative Ranking Curve; (MTrPs), myofascial trigger points; (TENS), transcutaneous electrical nerve stimulation; (NSAIDs), non-steroidal anti-inflammatory drugs; (VEGF), vascular endothelial growth factor; (BFGF), basic fibroblast growth factor.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest.

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