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REVIEW

Tuina Combined with Other Treatment Methods for Scapulohumeral Periarthritis (Frozen Shoulder): Bayesian Network Meta-Analysis

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Background: Frozen Shoulder (FS), a debilitating stage of scapulohumeral periarthritis (SP), significantly impairs daily life and working capacity. Compared with pharmacological treatments and surgical interventions, Tuina offers the advantages of being non-invasive and safe. Although substantial clinical evidence supports the efficacy of Tuina in treating FS, most studies involve its combination with other therapeutic modalities. The effectiveness and safety of various Tuina combinations remain unclear. Therefore, a network meta-analysis is warranted to provide a more comprehensive evidence-based foundation for clinical decision-making.

Methods: Randomized controlled trials (RCTs) investigating Tuina for Frozen Shoulder were systematically retrieved from PubMed, Web of Science, Embase, Cochrane Library, CNKI, VIP, Wanfang, and SinoMed. The search was conducted up to May 20, 2025. Data analysis was performed using R 4.2.0 and Stata 16.0.

Results: A total of 23 RCTs involving 11 intervention measures were included. Network meta-analysis results indicated that the effective rates of Tuina combined with Acupotomy, Tuina combined with external application of traditional Chinese medicine, Tuina combined with acupuncture, and Tuina combined with Leverspin Technique were significantly higher than those of Tuina alone ($P < 0.05$). The top three rankings based on Surface Under the Cumulative Ranking Area (SUCRA) were as follows: Tuina combined with Leverspin Technique (0.81), Tuina combined with acupuncture (0.75), and Tuina combined with Acupotomy (0.64). Regarding Visual Analog Scale (VAS) scores, Tuina combined with Acupotomy demonstrated superior efficacy compared to Tuina alone ($P < 0.05$). The top three SUCRA rankings for VAS were: Tuina combined with Acupotomy (0.70), Tuina combined with Fu's subcutaneous needling (0.66), and Tuina combined with acupuncture (0.65). Considering all factors, Tuina combined with acupuncture and Tuina combined with Acupotomy are the optimal intervention strategies for scapulohumeral periarthritis (Frozen Shoulder).

Conclusion: Based on the available evidence, Tuina combined with acupuncture and Tuina combined with Acupotomy represent the most effective interventions for scapulohumeral periarthritis (Frozen Shoulder). However, there is the possibility of heterogeneity and publication bias.further high-quality research is required to validate and refine these conclusions.

Keywords: Tuina, scapulohumeral periarthritis, frozen shoulder, network meta-analysis

Introduction

Scapulohumeral periarthritis (SP) is a common disease characterized by shoulder pain and limited mobility. The peak age of onset is between 40 and 60 years old, and the prevalence of this disease in the general population is approximately 2% to 5%.[1] Frozen Shoulder(FS) is the most hazardous stage of SP during the disease's progression. This stage is characterized by fibrosis of the shoulder joint capsule, synovial hyperplasia and a significant reduction in joint cavity volume, resulting in severe limitation of shoulder joint movement in patients, which seriously affects daily

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living and working ability. More seriously, if left untreated, about 15–20% of patients may develop chronic refractory FS and eventually require surgical treatment, which may lead to complications such as humeral fractures and rotator cuff tears.[2] Therefore, a thorough understanding of the epidemiological characteristics of FS, especially identifying high-risk populations and seizing critical treatment opportunities, is of great significance for improving the prognosis of patients.

At present, the treatment of FS is mainly divided into two categories: conservative treatment and surgical treatment. Conservative treatment includes drug therapy, physical therapy, local injection therapy, among which non-steroidal anti-inflammatory drugs (NSAIDs) and glucocorticoid injection are the most commonly used drug intervention methods.[3] Physical therapy includes joint range of motion training, muscle strength training, and emerging neuromuscular training. Studies have shown that physical therapy combined with glucocorticoid injection may be more effective than physical therapy alone.[4] However, there are individual differences in the efficacy of conservative treatment, and some patients do not see improvement in symptoms after 3–6 months of conservative treatment, at which point surgical treatment may need to be considered. Surgical treatment mainly includes manual release under anesthesia and arthroscopic capsule release. While these surgeries can quickly improve joint range of motion, they carry the risk of complications such as fractures, glenoid injuries, and nerve injuries. It is notable that studies have shown that manual release under anesthesia may not be more effective than physical therapy and may cause joint injury.[5] In recent years, a number of new treatments have come into the spotlight. For example, minimally invasive treatments such as ultrasound-guided water separation and hyaluronic acid injection have shown some potential for application.[6] In addition, proprioceptive neuromuscular augmentation techniques (PNF) also show unique advantages in improving shoulder joint structure and function.[7] However, the long-term efficacy and safety of these new therapies still need further research.

Tuina, as a traditional Chinese medical treatment technique, has shown unique advantages in the treatment of SP. Compared with the possible systemic side effects of drug treatment and the high risk of surgical treatment, Tuina has gained widespread attention for its non-invasiveness and safety. Studies have shown that Tuina can significantly improve shoulder joint range of motion, and its efficacy is even better than oral dexamethasone.[8] Through specific manipulation, Tuina not only relieves pain but also effectively reduces swelling of the shoulder joint capsule and improves rotator cuff muscle group function, thereby shortening the course of the disease.[9] In clinical practice, the immediate effect of Tuina is particularly remarkable. For example, compared with medium-frequency electrotherapy, Tuina showed significant advantages in pain relief and improvement of Constant-Murley scores at weeks 3 and 6 of treatment.[9] MRI observations showed that the Tuina treatment group was more effective in reducing edema around the shoulder joint capsule and reducing the thickness of the axillary brachial joint capsule, as well as improving the diffusion status of water molecules in the rotator cuff muscle group. These findings provide objective imaging evidence for the clinical efficacy of Tuina.[9] In terms of FS, there was also a definite effect. A meta-analysis showed that acupuncture combined with Tuina had a better effect than the acupuncture group (RR=1.21,95% CI[1.16–1.26]).[10] Although there is a considerable amount of clinical evidence for Tuina in treating FS, most of it involves the combination of other methods (based on current evidence, non-pharmaceutical therapies such as acupuncture, needle-knife, and exercise therapy are frequently used). There is a lack of high-quality evidence comparing the efficacy of different treatment methods, which increases clinical uncertainty. It is still unclear which combination of Tuina with other methods offers the best efficacy and safety, making it difficult to determine the optimal treatment plan. Therefore, it is necessary to conduct a network meta-analysis, which can not only evaluate the relative effects of Tuina with other treatments, but also provide a more comprehensive evidence-based basis for clinical decision-making, clarify future research directions, and promote the standardization and normalization of Tuina for FS.

Methods

Registration

Our study was conducted in accordance with the PRISMA guidelines.This study has been registered with PROSPEO (CRD420251057992).

Literature Search

Randomized controlled trials of Tuina for Frozen Shoulder published in PubMed, Web of Science, Embase, Cochrane Library, CNKI, VIP, Wanfang, SinoMed were retrieved. Searches were conducted using a combination of subject terms and free terms. The search period is from establishment to May 20, 2025 (Supplementary materials 1).

Eligibility Criteria

Study Subjects

Patients who met the diagnostic criteria for Frozen Shoulder. Since the included studies used different diagnostic criteria, those who clearly stated that they met the diagnostic criteria for Frozen Shoulder could be included. Patients' age, gender, disease duration, etc. were not restricted.

Intervention: The observation group used Tuina in combination with other treatments (eg acupuncture, acupotomy, exercise, etc).

Control

Tuina was used (Consistent with the Tuina in the observation group).

Outcome Measure

Effective rate; Visual Analog Scales(VAS) score:[11] used to assess pain intensity. On a scale of 0 to 10, the lower the score, the less severe the pain.

Study type:randomized controlled trial.

Exclusion Criteria

Repeated publication; incomplete or unavailable data reporting; reviews, abstracts, letters, etc.; intervention measures, outcome indicators, etc. do not meet the requirements; unable to form a network meta-analysis.

Risk of Bias Assessment

The Cochrane Handbook 5.3.0-recommended risk of bias assessment tool ROB2[12] was used to evaluate the quality and risk of bias of the included literature. ROB2 sets five assessment domains: bias in the randomization process, bias due to deviations from the intended intervention, bias due to missing outcome data, bias in outcome measurement, and bias due to selective reporting of results. The risk of bias in each domain can be classified into three levels: low risk, unknown risk, and high risk. If the risk of bias assessment results in all domains are "low risk", then the overall risk of bias is "low risk"; if the risk of bias assessment results in some domains are "some risk" and there are no domains with "high risk", then the overall risk of bias is "some risk"; as long as the risk of bias assessment result in one domain is "high risk", then the overall risk of bias is "high risk". Two researchers independently conducted the evaluation, compared the results, and if there was a disagreement, they consulted a third researcher or made a decision through discussion.

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.

Statistical Analysis

Statistical analysis was performed using Stata16.0 and R4.2.0. For binary variables, relative risk (RR) was used, for continuous variables, the mean difference (MD) was used, and the 95% confidence interval (CI) was calculated. The I^2 statistic test was used to determine the size of heterogeneity, and when $I^2 < 50\%$, it indicated no statistical heterogeneity; When $I^2 > 50\%$, 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. Use the Bayesian random effects model to compare the effects between interventions in order to compare the effectiveness of various intervention methods. The Markov chain Monte Carlo method was used for modeling, with four Markov chains running simultaneously and 20,000 annealing cycles, followed by 50,000 simulation iterations to complete the modeling. Bias Information Criteria (DIC) will be used to compare model fitting and global consistency, and node splitting will be used to analyze local consistency if there is a closed-loop mesh. In addition, the interventions were sorted based on SUCRA, and a league table was generated to compare the differences in effects among the various interventions. Subgroup analysis and sensitivity analysis were used to further analyze the results. When the number of studies included for outcome measures was ≥10, funnel plots were used for intuitive response to publication bias.

Evaluation of Evidence Quality

Use CINeMA[13] 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 evidence quality grades were high, medium, low and very low quality grades.

Results

Study Selection

A preliminary search yielded 2,399 relevant papers, and after screening, 23 studies[14–36] were finally included. Figure 1 shows the screening flowchart.

Study Characteristics

This study included 23 studies,[14–36] all authors from China, with a total of 1758 patients (881 in the experimental group and 877 in the control group). There were 11 interventions in the experimental group: Tuina combined with Acupotomy, Tuina combined with acupuncture and moxibustion, Tuina combined with electropuncture Tuina with External application of Chinese medicine, Tuina with acupuncture, Tuina with pricking blood and cupping, Tuina with exercise Tuina combined with nerve block, Tuina combined with ultrasonic, Tuina combined with Fu's subcutaneous needling, Tuina combined with Leverspin Technique. Table 1 shows the basic characteristics of the included studies.

Risk of Bias in Studies

11 studies used the random number table method, 2 studies grouped by treatment regimens, 2 studies grouped by visit order, and 8 studies did not mention the specific randomization method. All studies did not specify the allocation of hidden protocols and blinding methods. 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. Nineteen studies were of "moderate risk" (82.6%), and four studies were of "high risk" (17.4%).Figure 2 show the risk of bias results of the included studies.

Meta-Analysis

Effective Rate

The Effective rate was reported in 20 studies that included 10 treatments, and Tuina combined with Acupotomy had the largest number of studies compared with Tuina (4) (Figure 3). The results of the inconsistency test showed $P > 0.05$, and there were no closed loops in the mesh graph, which was analyzed using the consistency model. Heterogeneity test results showed I^2=11%, indicating low heterogeneity. Reticular meta-analysis results showed that Tuina combined with Acupotomy, Tuina combined with external application of traditional Chinese medicine, Tuina combined with acupuncture, and Tuina combined with Leverspin Technique were more effective than Tuina, and the differences were statistically significant ($P < 0.05$) (Figure 4). There was no significant difference in effect among the interventions (supplementary materials 2). The SUCRA in order is: Tuina combined with Leverspin Technique (0.81) > Tuina combined with acupuncture (0.75) > Tuina combined with Acupotomy (0.64) > Tuina combined with External

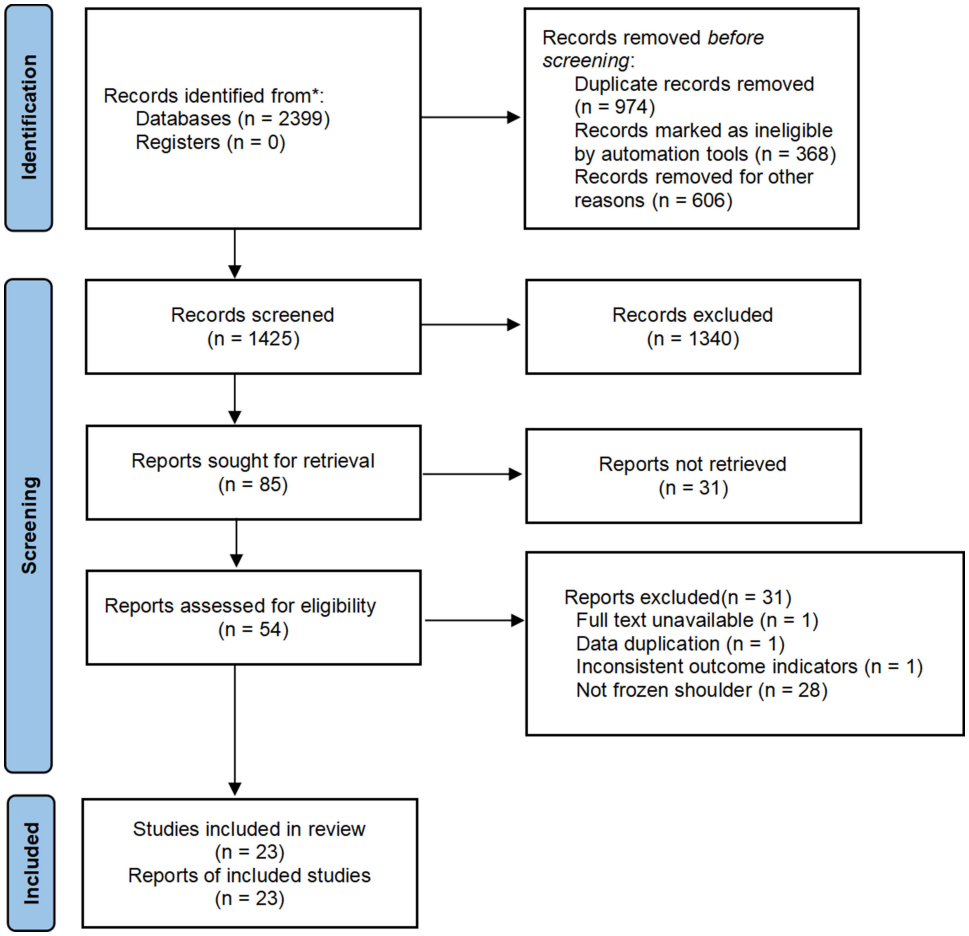

Figure 1 The screening flowchart.
Notes: PRISMA figure adapted from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International Journal of Surgery 2021;88:105906. Creative Commons.[37]

application of Chinese medicine (0.57) > Tuina combined with pricking blood and cupping (0.52) > Tuina combined with nerve block (0.49) > Tuina combined with Fu's subcutaneous needling (0.48) > Tuina combined with electropuncture (0.47) > Tuina combined with acupuncture and moxibustion (0.42) > Tuina combined with exercise (0.22) > Tuina (0.08) (Figure 5).

VAS

Fourteen studies reported the VAS score, which included 10 treatments, and Tuina combined with Acupotomy had the largest number of studies compared with Tuina (5) (Figure 6). The results of the inconsistency test showed $P > 0.05$, and there were no closed loops in the mesh graph, which was analyzed using the consistency model. Heterogeneity test results showed I^2=4%, indicating low heterogeneity. Reticular meta-analysis results showed that Tuina combined with Acupotomy was more effective than Tuina, and the difference was statistically significant ($P < 0.05$) (Figure 7). There was no significant difference in effect among the interventions (supplementary materials 2). The SUCRA order was: Tuina combined with Acupotomy (0.70) > Tuina combined with Fu's subcutaneous needling (0.66) > Tuina combined with acupuncture (0.65) > Tuina combined with pricking blood and cupping (0.64) > Tuina combined with nerve block (0.56) > Tuina combined with ultrasonic (0.48) > Tuina combined with acupuncture and moxibustion (0.45) > Tuina combined with External application of Chinese medicine (0.41) > Tuina combined with exercise (0.37) > Tuina combined with electropuncture (0.34) > Tuina (0.18) (Figure 5).

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Table 1 The Basic Characteristics of the Included Studies

Researchers	Ref	Year	Sample Size		Age		Gender (Male/Female)				Interventions		Course of Treatment	Outcome Indicators
			Experimental Group	Control Group	Experimental Group	Control Group	Experimental Group		Control Group		Experimental Group	Control Group		
Zhi Liangxi	[14]	2002	54	54	58.32±1.13	58.71±1.53	21	33	19	35	2 + 1	1	20d	Effective rate
Huang Huixian	[15]	2006	28	24	41-65	42-63	12	16	10	14	3 + 1	1	8d	Effective rate
Peng Cheng	[16]	2012	30	30							4 + 1	1	10d	Effective rate, VAS
Feng Jihua	[17]	2012	25	25	40-56	38-53	14	11	13	12	5 + 1	1	42d	Effective rate
Lv Lei	[18]	2013	40	40	54.98±3.12		48/32				6 + 1	1	14d	Effective rate, VAS
Guo Song	[19]	2013	40	40	48-75		16	24			2 + 1	1	10d	Effective rate
Guo Jianbin	[20]	2014	40	40	54.3±12.5	53.5±13.6	17	23	16	24	5 + 1	1	14d	Effective rate
Wang Hailong	[21]	2015	48	49	44-61	42-59	22	26	21	28	2 + 1	1	20d	Effective rate, VAS
Wang Yanwei	[22]	2018	28	28	51.5	51.5	10	18	12	16	7 + 1	1	10d	Effective rate, VAS
Zhang Chunjian	[23]	2018	36	36	50.5±7.7	51.9±7.1	19	17	18	18	2 + 1	1	40d	Effective rate
Liu Gang	[24]	2019	61	61	52.07±7.69	53.11±7.85	25	36	26	35	5 + 1	1	14d	Effective rate, VAS
Yang Wenguang	[25]	2019	30	30	51.3±6.5	52.1±6.7	14	16	13	17	8 + 1	1	28d	Effective rate
Huang Da	[26]	2020	30	30	55.03±4.61	53.70±4.76	16	14	13	17	6 + 1	1	28d	Effective rate, VAS
Wei Meng	[27]	2020	31	30	51.07±5.68	50.41±5.20	12	19	10	20	9 + 1	1	28d	VAS
Wu Ting	[28]	2020	28	28	53.35±2.4	55.13±3.8	12	16	13	15	10 + 1	1	28d	Effective rate
Liu Haijun	[29]	2021	51	51	50.15±4.46	51.13±4.74	18	33	20	31	6 + 1	1	14d	Effective rate, VAS
Ye Xiongfeng	[30]	2021	39	39	59.46±5.98	58.48±6.53	18	21	25	14	10 + 1	1	28d	Effective rate, VAS
Deng Changmao	[31]	2022	30	30	52.00±4.32	52.13±3.97	13	17	12	18	6 + 1	1	14d	VAS
Liu Kan	[32]	2022	60	60	53.11±8.02	51.26±7.59	20	40	21	39	11 + 1	1	8d	VAS
Huang Shaoying	[33]	2022	30	30	58.03±3.20	58.32±3.21	11	19	12	18	12 + 1	1	10d	Effective rate
Hou Zhanyi	[34]	2022	57	57	54.80±6.14	56.26±5.74	36	21	32	25	11 + 1	1	30d	Effective rate
Lin Jingjing	[35]	2022	30	30	55.23±4.08	54.27±4.67	11	19	12	18	3 + 1	1	21d	Effective rate, VAS
Zhao Baoli	[36]	2022	35	35	62.94±12.64	57.60±10.71	8	27	14	21	6 + 1	1	7d	Effective rate, VAS

Note:1=Tuina; 2=Acupuncture; 3=Pricking blood and cupping; 4=Exercise; 5=External application of Chinese medicine; 6=Acupotomy; 7=Nerve block; 8=Leverspin Technique; 9=Ultrasonic; 10=Fu's subcutaneous needling; 11=Acupuncture and moxibustion; 12=Electropuncture.

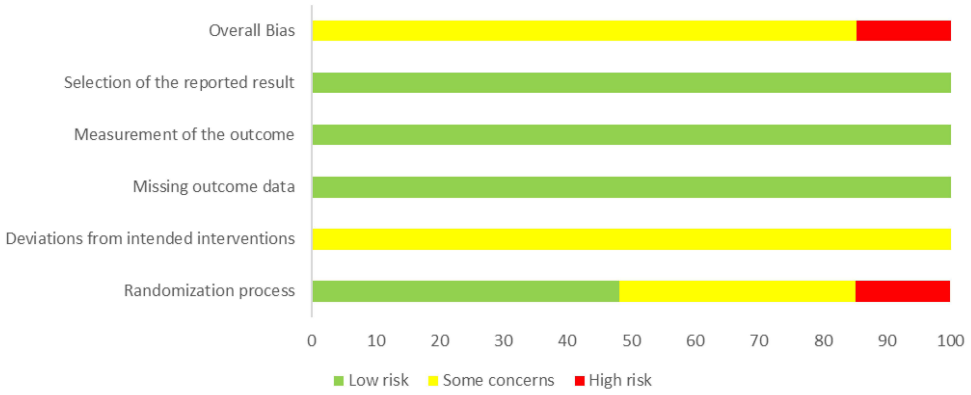

Figure 2 Risk of bias graph.

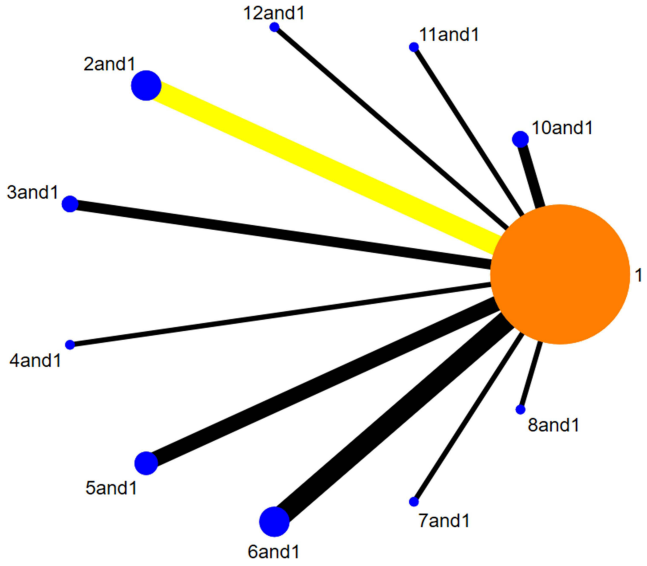

Figure 3 Correlation graph of the Effective rate of Tuina combined with other methods in the treatment of FS.

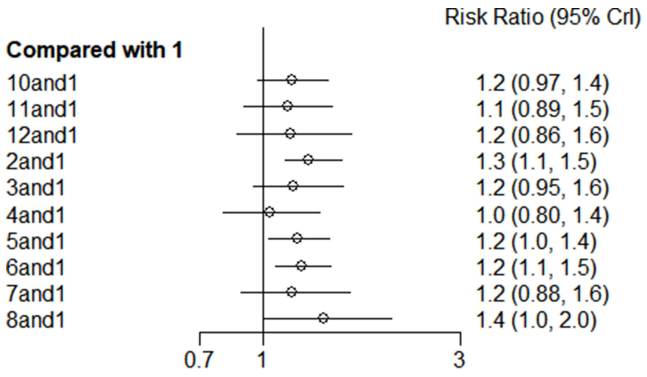

Figure 4 Forest plot of the Effective rate of Tuina in combination with other methods for FS.

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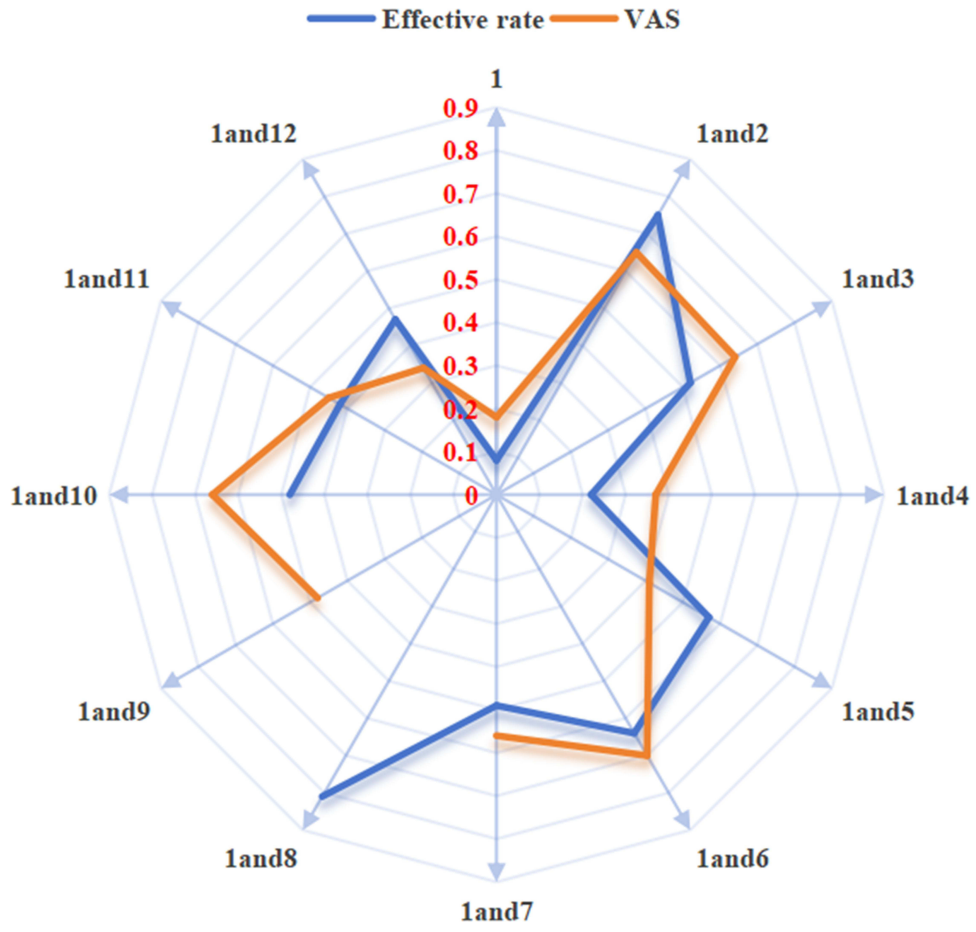

Figure 5 SUCRA sorting.

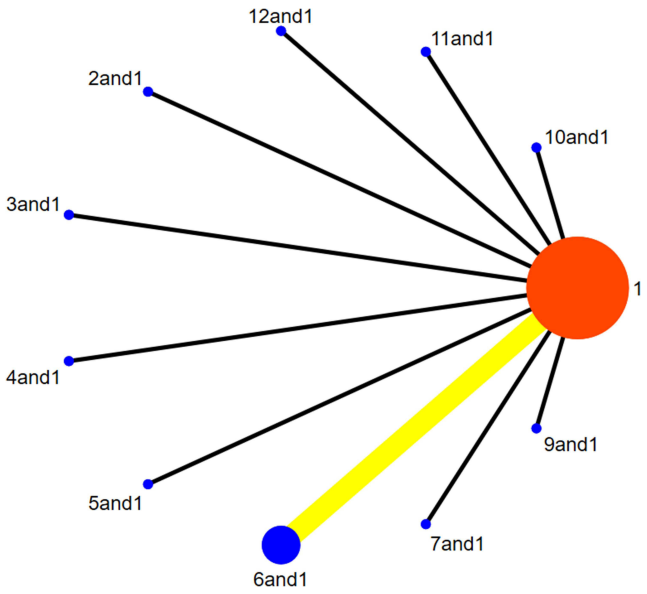

Figure 6 Correlation graph of the VAS of Tuina combined with other methods in the treatment of FS.

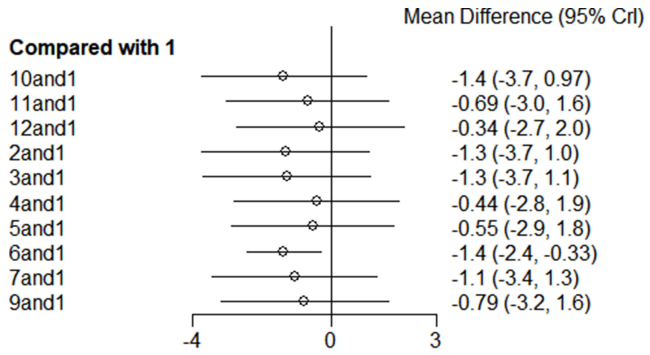

Figure 7 Forest plot of the VAS of Tuina in combination with other methods for FS.

Publication Bias Analysis

The results of Efficacy and VAS were tested for publication bias, and the results showed that Effective rate had a higher likelihood of publication bias ($P < 0.05$), while VAS had a lower likelihood of publication bias ($P > 0.05$) (Table 2, Figures 8a and b).

Evaluation of Evidence Quality

Use CINeMA for evidence quality assessment. The results showed 1 (5%) of high quality evidence, 7 (35%) of medium quality evidence, and 12 (60%) of low quality evidence. The downgrading was mainly due to inter-study bias, imprecision, and heterogeneity (supplementary materials 3).

Discussion

The aim of this study is to investigate the most effective combination of Tuina therapy for Frozen Shoulder (FS), thereby providing a more comprehensive, evidence-based foundation for clinical decision-making. The results of the network meta-analysis demonstrated that Tuina combined with Acupotomy, Tuina combined with electroacupuncture, Tuina combined with acupuncture, and Tuina combined with Leverspin Technique were significantly more effective than Tuina alone ($P < 0.05$). However, no significant differences in efficacy were observed among these interventions. Although Tuina combined with exercise exhibited the best effect, only one study was included, rendering the evidence insufficient. In contrast, Tuina combined with acupuncture and Tuina combined with Acupotomy were supported by a large number of studies, providing robust evidence and higher credibility. Taking all available evidence into account, we conclude that Tuina combined with acupuncture and Tuina combined with Acupotomy yield favorable outcomes.

Tuina may alleviate pain by modulating the levels of pain-related substances and enhancing local circulation. Studies have shown that Tuina can regulate the levels of pain-inducing substances such as substance P and serotonin, as well as analgesic factors like β-endorphin, to relieve pain.[38] For instance, massage manipulation reduces the expression of substance P in the dorsal root ganglion, thereby exerting its analgesic effects.[39] Additionally, Tuina significantly decreases the expression of the pro-inflammatory factor interleukin-21 in mouse serum and spinal cord while inhibiting the expression of the neurotransmitter 5-hydroxytryptamine receptor protein.[40] Furthermore, lactate levels in rat serum decrease after Tuina treatment, suggesting that the analgesic effect of Tuina may be associated with reduced lactate levels.[41] By controlling these pain-related substances, Tuina plays an analgesic role. Moreover, Tuina improves local blood circulation and accelerates the absorption of pain-inducing substances, thereby alleviating pain. Tuina also

Table 2 Results of the Publication Bias Test

	Effective Rate	VAS
Egger	0.009	0.52
Begg-Mazumdar	0.014	0.25
Thompson-Sharp	0.03	0.78

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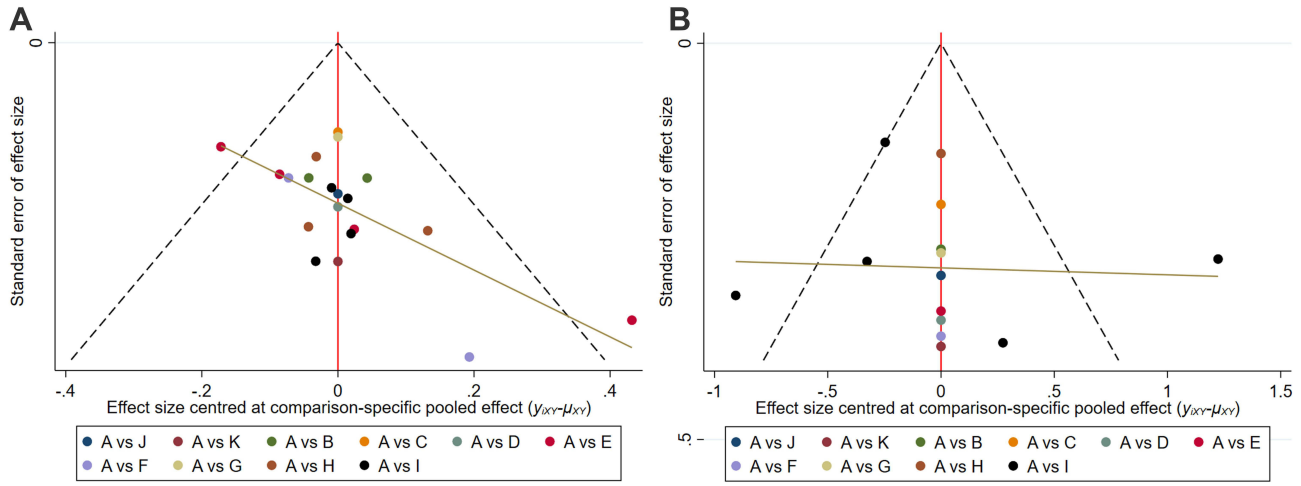

Figure 8 (**A**) Funnel plot of the Effective rate of a Tuina combined with other methods in treating FS. (**B**) Funnel plot of the VAS of a Tuina combined with other methods in treating FS.

transmits non-noxious stimuli to the posterior horn of the spinal cord, exciting glial cells in the posterior horn while suppressing T-cell activity. This mechanism occupies the pathways of pain transmission to the spinal cord with non-noxious sensations, thereby reducing pain perception.[39]

Acupuncture can stimulate the release of enkephalin, thereby relieving pain, improving blood circulation, eliminating pathogenic factors early, and repairing damaged tissues.[42] Furthermore, damage to the tissue cells causes damage to the cell membrane layer, which disrupts the concentration cascade of cations within the cells and increases the influx of Ca2+, thus raising the Ca2+ concentration and leading to edema and degeneration of the cells. Acupuncture, however, can coordinate the range of intracellular Ca2+ activity, which may be related to restoring the cell's Ca2+ transport function, and has a significant promoting effect on tissue damage, especially on muscle tissue damage repair. Another study has shown that acupuncture can also regulate the immune function of the body, reduce the local aggregation of inflammatory cells, lymphocytes, etc. in the damaged area, lower the occurrence of disease in the damaged area, and help repair the damage.[43]

Acupotomy is a therapeutic technique that utilizes specially designed instruments to loosen local tendons, remove adhesions, and restore tissue nutrition. It can relax contracted tissues, improve local blood and lymph circulation, and promote the resolution of local inflammation as well as the repair of diseased tissues. Studies have shown that Acupotomy improves the pathological condition on the affected side in animals, reduces muscle fiber hyperplasia and abnormal thickening of the synovial membrane, and promotes the repair of peri-shoulder tissues.[44] Acupotomy can decrease 5-HT and PGE2 levels in animals, mitigate inflammatory responses, and significantly alleviate pain.[45] Acupotomy increases the levels of VEGF and TGF-β in damaged rat tissues, accelerates blood circulation at the affected area, and promotes the repair of abnormal tissues. It is believed that the mechanism of action of Acupotomy may be related to the fact that the mechanical injury induced by Acupotomy exacerbates the local lesion but simultaneously accelerates tissue repair.[46] After stimulating skeletal muscle cells, Acupotomy exerts a beneficial regulatory effect on apoptosis and autophagy of skeletal muscle cells, thereby alleviating muscle fatigue.[47] For Frozen Shoulder (FS), Acupotomy significantly reduces the levels of related inflammatory factors in patients' blood, decreases the thickness of the coracobrachialis brevator and posterior joint capsule, and increases the glenohumeral joint distance.[48] Acupotomy improves the pathological changes in local abnormal tissues in FS patients, suppresses the expression of inflammatory factors to control local aseptic inflammation, reduces pain sensitivity, and inhibits synovial thickening and tendon fiber proliferation, thereby promoting the repair of abnormal shoulder joint tissues.[49] Acupotomy removes and releases adherent tissues in the shoulder joint, thereby improving local blood circulation and restoring physiological mechanical balance, which facilitates the recovery from local aseptic inflammation.[50] The Tuina technique can further release adhered tissues, restore the functional activity of the shoulder joint, and relieve the pain and discomfort caused by

Acupotomy therapy. The combination of the two techniques demonstrates better efficacy.[51] We searched the Chinese Clinical Trial Registry and the International Clinical Trial Registry and identified several registered clinical trials investigating Tuina, massage, and Acupotomy for Shoulder Pain (SP) (eg, ChiCTR2400093757, ChiCTR2200067153, ChiCTR2100045798, ChiCTR2200055512, ChiCTR1800020134, NCT01307826, NCT06520254, NCT01022827). This indicates that Tuina treatment for SP remains a research hotspot.At present, acupuncture and tuina have become widely recognized as distinctive therapeutic methods of traditional Chinese medicine in the international community. The World Health Organization has recommended acupuncture and tuina as important supplementary treatment methods for over 100 diseases or symptoms. A survey by the World Federation of Acupuncture and Moxibustion Societies shows that as of 2013, tuina therapy has been promoted in 183 countries and has received attention from the mainstream medical community.[52] In recent years, randomized controlled trials on the treatment of insomnia, Parkinson's disease, chronic low back pain and other diseases with acupuncture and tuina have been published in international high-level journals, providing strong evidence-based support for the promotion of acupuncture and tuina. More and more countries and regions are attaching importance to the development and utilization of acupuncture and tuina therapy.[53] Tuina will have a brighter future.

At present, several published meta-analyses on Tuina for Shoulder Pain (SP) have confirmed that Tuina combined with acupuncture and Tuina combined with Acupotomy are more effective. The study by Song Jiefan et al demonstrated that Tuina combined with acupuncture was significantly more effective than Tuina alone in treating Frozen Shoulder (FS) (clinical efficacy: RR = 1.20, 95% CI [1.14–1.25], $P < 0.05$; VAS: MD = −1.01, 95% CI [−1.55, −0.47], $P < 0.05$).[10] Zhang Xiaoyan et al's study found that the clinical efficacy of Acupotomy combined with Tuina was significantly better than that of the control group (OR = 6.29, 95% CI [4.15, 9.15], $P < 0.05$).[51] He Shan et al's study showed that Acupotomy combined with Tuina had significantly better clinical efficacy compared to Tuina alone (RR = 1.26, 95% CI [1.13, 1.40], $P < 0.05$) and drug therapy (RR = 1.19, 95% CI [1.06, 1.33], $P < 0.05$).[54] These findings collectively support the credibility of our conclusions.

Limitations of this study: Potential heterogeneity may exist due to the following factors: (1) Complexity of interventions: Tuina therapy exhibits substantial diversity across studies. The included trials employed varying manipulation techniques with significant differences in operational parameters (intensity, frequency, duration), acupoint selection and combination, individual session duration, and total treatment course. Moreover, most studies incorporated additional therapeutic approaches, constituting the primary source of clinical heterogeneity. (2) Variability in patient characteristics: Enrolled patients demonstrated heterogeneity in disease duration and baseline severity, with differential responsiveness to Tuina therapy across clinical states. (3) Outcome assessment discrepancies: Although primary outcomes focused on efficacy rates and VAS scores, the specific measurement scales and critical evaluation timepoints (eg, short-term vs long-term follow-up) showed inconsistent implementation across studies. (5) Methodological variations: Risk-of-bias assessment of included RCTs revealed varying degrees of concerns regarding randomization, allocation concealment, and blinding procedures, with lower-quality studies potentially yielding unstable results.Publication bias may be present due to: (1) Selective outcome reporting, where research teams preferentially publish statistically significant positive outcomes while suppressing negative or null results (particularly those demonstrating no difference between manipulation techniques). (2) Language and retrieval bias: Despite comprehensive searches across Chinese and English databases, some negative findings published in regional Chinese journals or grey literature may have been overlooked. International journals' preference for positive Tuina outcomes may further contribute to bias. Small-study effects: Funnel plot asymmetry often associates with small sample sizes and low-precision studies. This underscores the need for exhaustive literature retrieval in future research, particularly for negative results, to mitigate publication bias. The analysis was limited by few outcome measures, primarily focusing on efficacy rates and VAS scores, with insufficient examination of shoulder range of motion and activities of daily living scales. Only two studies reported inflammatory markers: Liu K[32] demonstrated lower post-treatment CRP and IL-6 levels in the intervention group ($P<0.05$), while Hou ZY[34] reported reduced IL-6, IL-10, GM-CSF, and TNF-α levels ($P<0.05$). Current data suggest superior efficacy in experimental groups, though substantial clinical evidence remains necessary for confirmation. Future research should enhance literature collection to comprehensively evaluate Acupotomy combined with Tuina therapy.

Despite rigorous inclusion criteria, these methodological challenges persist—a common limitation in meta-analyses that necessitates strict adherence to PRISMA guidelines and improved clinical trial quality for resolution.

Conclusions

Taking all the evidence into account, we conclude that Tuina combined with acupuncture and Tuina combined with Acupotomy are the most effective interventions for scapulohumeral periarthritis (Frozen Shoulder). However, owing to the limitations of the current studies, this conclusion requires further validation and refinement through additional high-quality research.

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Disclosure

The authors declare that they have no conflicts of interest.

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