

Review Article

Needle knife therapy combined with chinese herbal medicine in the treatment of knee osteoarthritis: a meta-analysis

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Abstract: Objective: To systematically evaluate the effectiveness of the combined Needle Knife Therapy (NKT) and Chinese Herbal Medicine (CHM) treatment for knee osteoarthritis (KOA) and to provide clinical evidence supporting its application in managing the condition. Methods: Relevant articles were retrieved from PubMed, Medline, Embase, Wanfang, and China National Knowledge Network (CNKI) from the inception of the databases up to February 18, 2023. Randomized controlled trials (RCTs) on the efficacy of NKT combined with CHM were appraised for inclusion. The meta-analysis was conducted using RevMan 5.3 and was registered with the International Platform of Registered Systematic Review and Meta-analysis Protocols (INPLASY) (202470051). Results: A total of 11 RCTs involving 880 patients were included. The meta-analysis showed that the combined therapy was superior to NKT alone in the treatment of KOA [relative risk (RR) = 1.09; 95% confidence interval (CI): (1.03, 1.14); P = 0.002]. The combined therapy showed a significant reduction in the Visual Analog Scale (VAS) score [RR = -0.98; 95% CI: -1.12, -0.84; P < 0.00001] and symptom scores [RR = -1.75; 95% CI: (-1.87, -1.63); P < 0.00001] compared to single NT therapy. There was no significant difference in the Traditional Chinese Medicine (TCM) syndrome scores between the two groups [RR = -0.23; 95% CI: (-0.56, 0.10); P = 0.18]. Furthermore, we observed a marked increase in lysholmy scores in the combination group than in the control group [RR = -1.04; 95% CI: (-1.31, -0.77); P < 0.00001]. Conclusions: The combination of needle-knife therapy and Chinese herbal medicine exhibits promising clinical efficacy in the treatment of KOA.

Keywords: Needle-knife therapy, chinese herbal medicine, knee osteoarthritis, efficacy, meta-analysis

Introduction

Knee osteoarthritis (KOA) is a condition characterized by cartilage degradation and damage to the underlying bone within the knee joint, leading to disability and pain, affecting millions of people worldwide [1]. As the most prevalent type of arthritis, KOA is particularly prevalent in the elderly population, whose joints have sustained cumulative damage over time [2]. With the global aging population increasing, the incidence of KOA continues to rise, imposing a substantial medical and economic burden on both patients and society. Conventional treatment options consist of pharmacotherapy, physical therapy, and surgical interventions [3, 4]. While these approaches have yielded some positive

results in mitigating symptoms and enhancing joint function, a considerable number of patients experience suboptimal outcomes [5, 6]. Therefore, exploring innovative treatment modalities is of paramount importance.

Needle-knife therapy (NKT) is a method that combines acupuncture and surgical release techniques [7]. This method employs the use of a needle-knife to release surrounding tissue in the joint, aiming to relieve pain and enhance joint functionality [8]. Traditional Chinese medicine has a long history of using herbal remedies to treat a vast array of ailments, including joint inflammation and pain [9]. Chinese herbal medicine (CHM) adopts a holistic approach to restore energy balance, or “qi”, in the body by

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employing a variety of herbs to counteract the disharmony seen in KOA [10]. These herbal concoctions can act synergistically to reduce inflammation, relieve pain, and promote joint health [11]. The integration of NKT with CHM may offer a novel therapeutic strategy to address the limitations of existing treatment methods [12]. However, to this point, no comprehensive study has been conducted to assess the effectiveness of NKT in conjunction with CHM for KOA treatment.

This meta-analysis aims to critically evaluate the existing research on the combined use of NKT and CHM to evaluate the efficacy and safety of this approach compared to conventional treatments. This meta-analysis represents an innovative approach in the field of KOA treatment by merging contemporary evidence-based practices with traditional Chinese medicine. As the first comprehensive synthesis evaluating the combined effects of NKT and CHM on patients with KOA. The novelty of this study lies in its exploration of a potentially transformative integrative therapy that could address the multifaceted nature of KOA by not only alleviating symptoms but also promoting overall joint health.

Methods

The review protocol was developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [13]. The Meta-analysis was registered with INPLASY under registration number INPLASY202470051.

Literature search

We retrieved articles from PubMed, Medline, Embase, Wanfang, and the CNKI from their inception up to February 18, 2023. Our search strategy involved a combination of subject headings and free-text terms, using keywords such as 'Needle Knife', 'Small Needle Knife', 'Therapy', 'Treatment', 'Chinese traditional treatment', 'Chinese Herbal Medicine', 'Osteoarthritis of Knee', 'KOA', and 'Knee Osteoarthritis'. Two reviewers performed the literature search independently with the search strategy (Knee Osteoarthritis [Mesh] OR Osteoarthritis, Knee [Mesh] OR Osteoarthritis of Knee OR Osteoarthritis of the Knee OR Knee Osteoarthritis OR KOA) AND (Needle Knife OR Acupuncture

OR Small Needle Knife OR Chinese Traditional Treatment OR Therapy OR Treatment).

Eligibility criteria

The literature inclusion criteria were as follows: 1. Study Design: Randomized Controlled Clinical Trial. 2. Participants: Patients diagnosed with KOA, with no restrictions on age or disease duration. 3. Intervention: The intervention group received a combination of needle-knife therapy and Chinese herbal medicine, whereas the control group received needle knife therapy alone.

The literature exclusion criteria were as follows: (1) Studies that were duplicates or had incomplete data. (2) Animal experiments, conference proceedings, abstracts, reviews, or case reports.

Data extraction and quality assessment

The screening process was conducted independently by two authors (Peng and Wu) based on predefined inclusion and exclusion criteria, followed by cross-validation to ensure accuracy. In cases of discrepancies, a third researcher (Chen) was consulted to reach a consensus. Data extraction involved recording details such as author names, publication years, sample sizes, participants' ages, interventions, treatment durations, and outcome measures. The methodological quality of the included studies was evaluated using the Cochrane Handbook quality assessment tool.

Data analysis

RevMan version 5.3 was utilized to perform the meta-analysis. Mean differences (MD) along with their 95% confidence intervals (CIs) were employed to represent effect sizes for continuous data. Relative risk ratios and their corresponding 95% CIs were used to illustrate dichotomous variables. Heterogeneity among study outcomes was assessed via the χ^2 test and I^2 statistic. The I^2 statistic was used to quantify the proportion of variability in effect estimates due to heterogeneity rather than chance. An I^2 value of less than 25% was considered low heterogeneity, 25-50% was considered moderate heterogeneity, 50-75% was considered substantial heterogeneity, and greater than 75% was considered high heterogeneity.

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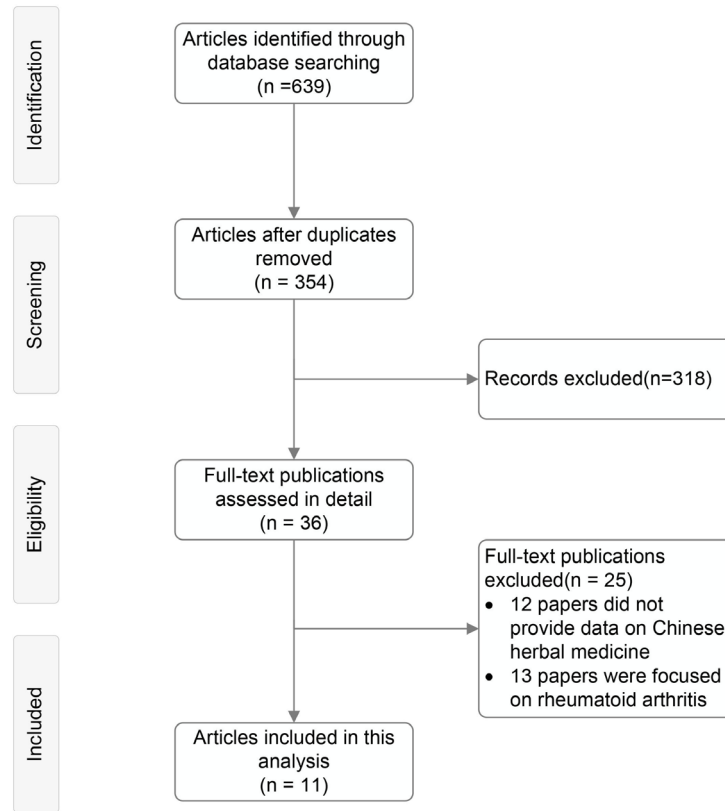


Figure 1. Study procedure and literature screening.

When significant heterogeneity was detected ($P < 0.10$), a random-effects model was employed. In the absence of significant heterogeneity ($P \geq 0.10$), a fixed-effects model was used to estimate the overall effect. The funnel plot analysis was employed to evaluate potential publication bias in the included studies. A significance level of $P < 0.05$ was considered statistically significant for differences between the intervention and control groups.

Results

Study selection and characteristics

The database search initially identified 639 articles, with 285 duplicates removed (**Figure 1**). After reviewing the references and conducting a preliminary screening of the titles and abstracts, a total of 36 articles were included. Full texts of the selected papers were obtained. After a full-text review, 25 papers were excluded: 12 did not provide data on Chinese herbal medicine, and 13 concentrated on rheumatoid arthritis. Consequently, eleven studies with a total of 880 cases were included in this meta-analysis (**Table 1**).

Quality control

The quality evaluation is presented in **Figure 2**. The Cochrane Collaboration tool was utilized to assess the quality of the eligible studies, revealing moderate quality of the included studies.

Clinical efficacy analysis

Nine randomized [20-28] trials, involving 880 patients, reported the clinical efficacy of needle-knife therapy combined with Chinese herbal medicine in treating KOA. A forest plot revealed that the combined therapy was superior to needle knife therapy alone in improving outcomes for KOA patients [RR = 1.09; 95% CI: (1.03, 1.14); $P = 0.002$], as shown in **Figure 3**.

VAS score

Six RCTs [20-23, 25, 28] were included in the analysis of the VAS score for knee joint pain in patients with KOA. The forest plots indicated a marked decrease in the VAS score in the combination group compared to the control group [RR = -0.98; 95% CI: -1.12, -0.84; $P < 0.00001$] (**Figure 4**).

Symptom scores

Symptom scores were used to evaluate the severity of arthritis or other joint conditions, including measures of joint pain, joint swelling, and joint mobility. Seven RCTs [20, 22, 23, 26-29] were analyzed to evaluate changes in symptom severity scores for KOA patients. The forest plots revealed a significant reduction in symptom scores in the combination group compared to the control group [RR = -1.75; 95% CI: (-1.87, -1.63); $P < 0.00001$] (**Figure 5**).

TCM syndrome scores

TCM syndrome scores were used to evaluate syndromes specific to TCM theory, which characterized disease pathogenesis and symptom manifestations. Three RCTs [20, 22, 28] were included in the analysis of TCM syndrome scores in patients with KOA. The forest plot indicated no significant differences in the TCM syndrome

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Table 1. The general characteristics of the selected literature

Study	Year	Country	Sample size		Age (years)		Interventions		Acupuncture Points	Chinese Herbal Medicine	Course of treatment	Outcome measures
			Observation group	Control group	Observation group	Control group	Observation group	Control group				
Liuan et al. [20]	2017	China	60	60	60.4±7.9	59.4±8.2	Yiwei Jiangu Soup + NKT	NKT	LV3, BL23, ST35, etc.	Yiwei Jiangu Soup (herbs: angelica, epimedium, etc.)	3 weeks	1-5
Ying et al. [21]	2019	China	20	20	5.70±3.61	58.25±7.19	Modified Shuanghe Decoction + NKT	NKT	GB34, ST36, SP9	Modified Shuanghe Decoction specified	2 months	1, 2, 5
Long et al. [22]	2019	China	63	63	65.6±6.7	65.8±6.2	Juanbi Decoction + NKT	NKT	GB34, ST36, BL23	Juanbi Decoction (Drynaria Rhizome, Eucommia Ulmoides, Achyranthes Bidentata, etc.)	15 days	1-4
Zhong et al. [23]	2016	China	32	32	42-65	43-65	Chinese Herbal Medicine + NKT	NKT	GB34, ST36, BL23	Chinese Herbal Formula (Ginseng, Drynaria, Wolfberry, etc.)	12 weeks	1-3
Wei-Ming et al. [24]	2013	China	23	21	20-73	21-75	Chinese Herbal Medicine + NKT	NKT	GB34, ST36, BL23	Chinese Herbal Formula (Salvia Miltiorrhiza, Angelica Sinensis, etc.)	20 days	1
Hua-Ming et al. [25]	2011	China	48	48	40-81	39-80	Chinese Herbal Medicine + NKT	NKT	GB34, ST36, BL23	Chinese Herbal Formula (Rehmannia, Drynaria, etc.)	21 days	1, 2
Huiping et al. [26]	2019	China	62	62	48.15±5.27	48.63±5.12	Sishen decoction + NKT	NKT	GB34, ST36, SP9	Sishen Decoction (Panax ginseng, Angelica sinensis, etc.)	20 days	1, 3
Qiang et al. [27]	2018	China	39	39	45.5±3.5	45.3±3.6	Qushi Huayu Jiedu Dingtong Decoction + NKT	NKT	GB34, ST36, BL23	Qushi Huayu Jiedu Dingtong Decoction (Scutellaria baicalensis, Bupleurum Chinense, etc.)	2 weeks	1, 3
Yong et al. [28]	2016	China	45	45	33-71	34-70	Chinese Herbal Medicine + NKT	NKT	GB34, ST36, BL23	Chinese Herbal Formula (Ginseng, Salvia, etc.)	2 months	1-4
Wenya et al. [29]	2017	China	19	19	34.7±11.2	35.6±12.9	Chinese Herbal Medicine + NKT	NKT	GB34, ST36, SP9	Chinese Herbal Formula (Ginkgo biloba, Panax ginseng, etc.)	4 weeks	3
Li et al. [30]	2016	China	30	30	60.77±9.36	0.40±9.69	Pseudo-ginseng-cake moxibustion + NKT	NKT	GB34, ST36, BL23	Pseudo-ginseng-cake (Pseudo-ginseng, Licorice, etc.)	3 weeks	5

(1) Clinical efficacy; (2) Visual analogue scale (VAS) score for knee pain; (3) Symptom scores (Joint pain, joint swelling, and joint movement scores); (4) Traditional Chinese Medicine syndrome scores; (5) Lysholmy scores. NKT: Needle knife therapy.

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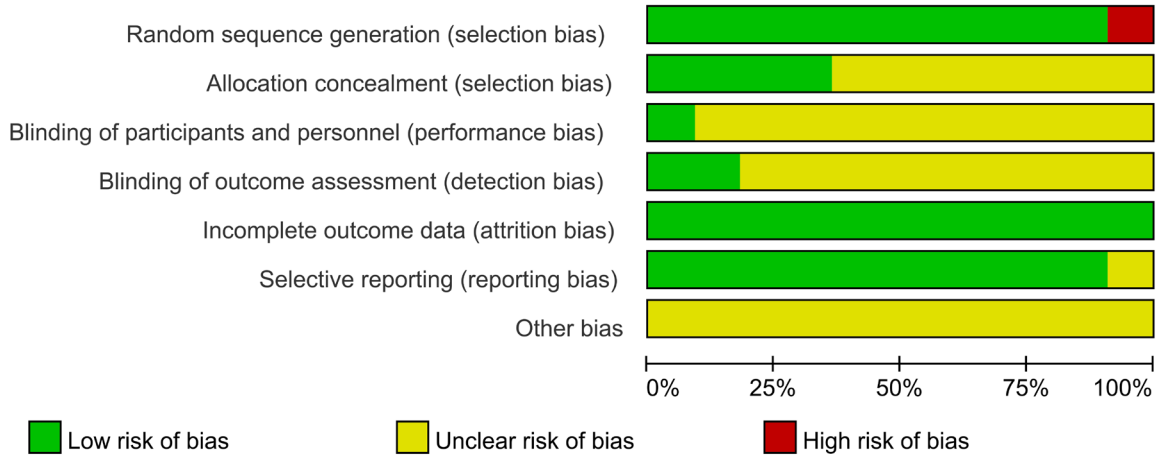


Figure 2. Risk of bias diagram.

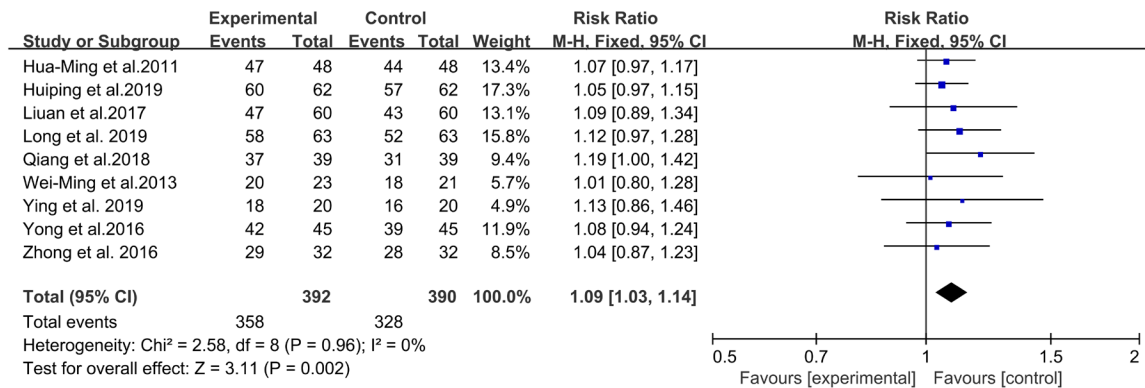


Figure 3. Meta-analysis of clinical efficacy of needle-knife therapy combined with Chinese herbal medicine in the treatment of KOA. KOA: Knee Osteoarthritis.

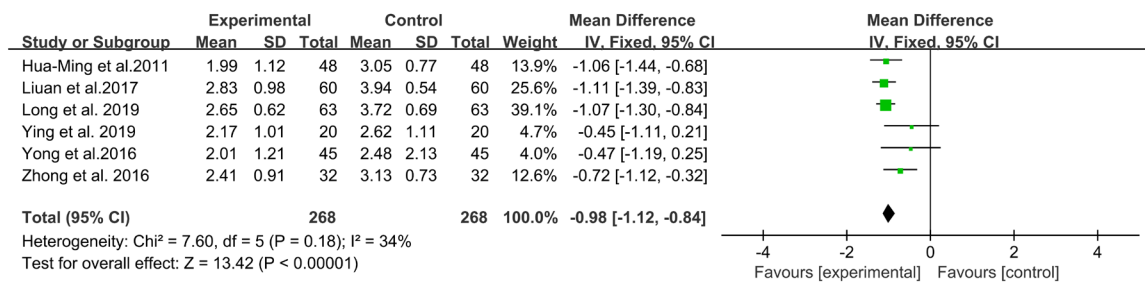


Figure 4. Meta-analysis of VAS score for knee joint pain in KOA patients. KOA: Knee Osteoarthritis; VAS: Visual Analog Scale.

scores between the two groups [RR = -0.23; 95% CI: (-0.56, 0.10); P = 0.18] (**Figure 6**).

Lysholm scores

Lysholm scores were used to assess knee function and pain, covering indicators such as joint

range of motion, pain level, daily life, and work ability. Three RCTs [20, 21, 30] were included in the analysis of Lysholm scores for KOA patients. The forest plot indicated a marked increase in Lysholm scores in the combination group compared to the control group [RR = -1.04; 95% CI: (-1.31, -0.77); P < 0.00001] (**Figure 7**).

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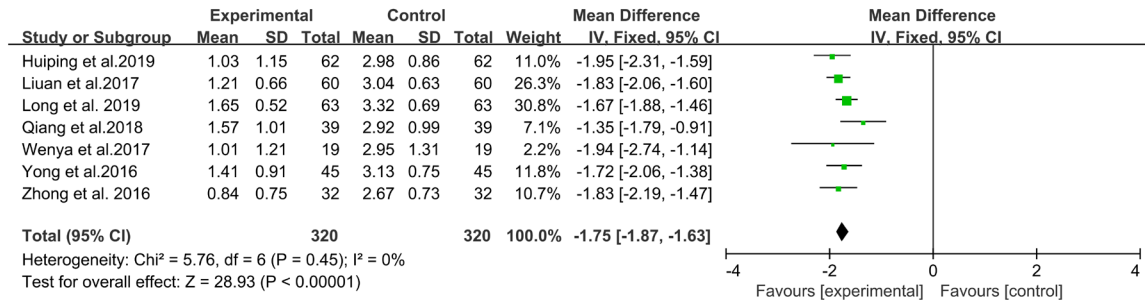


Figure 5. Meta-analysis of symptom scores for patients with KOA. KOA: Knee Osteoarthritis.

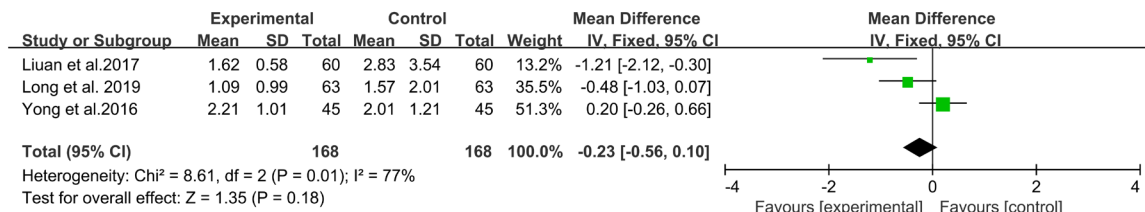


Figure 6. Meta-analysis of TCM syndrome scores for patients with KOA. KOA: Knee Osteoarthritis; TCM: Traditional Chinese Medicine.

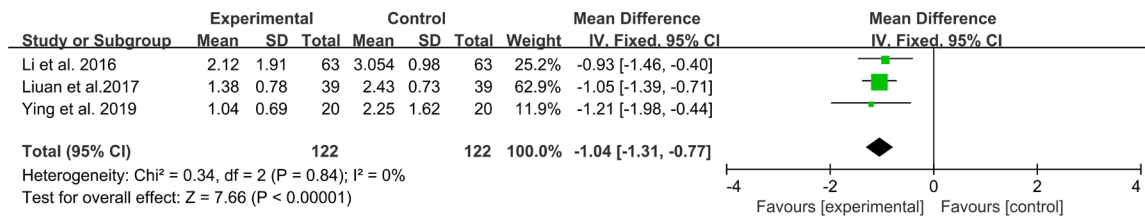


Figure 7. Meta-analysis of Lysholm scores for patients with KOA. KOA: Knee Osteoarthritis.

Publication bias

Funnel plot analysis of key outcome measures, including clinical efficacy, VAS scores, symptom scores, TCM syndrome scores, and Lysholm scores, indicated no significant publication bias. Consequently, the outcomes were consistent and reliable overall (**Figure 8**).

Discussion

Needle-knife therapy, an innovative approach that integrates the principles of traditional acupuncture with contemporary surgical methods, has demonstrated remarkable efficacy in managing pain and enhancing joint mobility [14]. This therapeutic approach targets specific acupuncture points and the surrounding tissues with precision, stimulating the release of endorphins and other natural pain-relieving sub-

stances in the body. Additionally, it aids in muscle relaxation and improves blood circulation [15]. In contrast, CHM addresses the root causes of joint disorders by modulating the body's immune and metabolic responses [16]. CHM uses a variety of herbs and natural substances that have been integral to TCM for centuries, known for their health-promoting and healing properties [5]. These herbal remedies not only reduce inflammation, alleviate pain, but also support the body's regenerative capabilities, aiding in the restoration of damaged articular cartilage - the key tissue that protects the joint [11, 17]. By combining needle-knife therapy with CHM, the resultant treatment modality leverages the advantages of both methods, creating a synergistic effect that can lead to improved therapeutic outcomes. Our findings revealed that the combined therapy significantly surpassed needle-knife therapy

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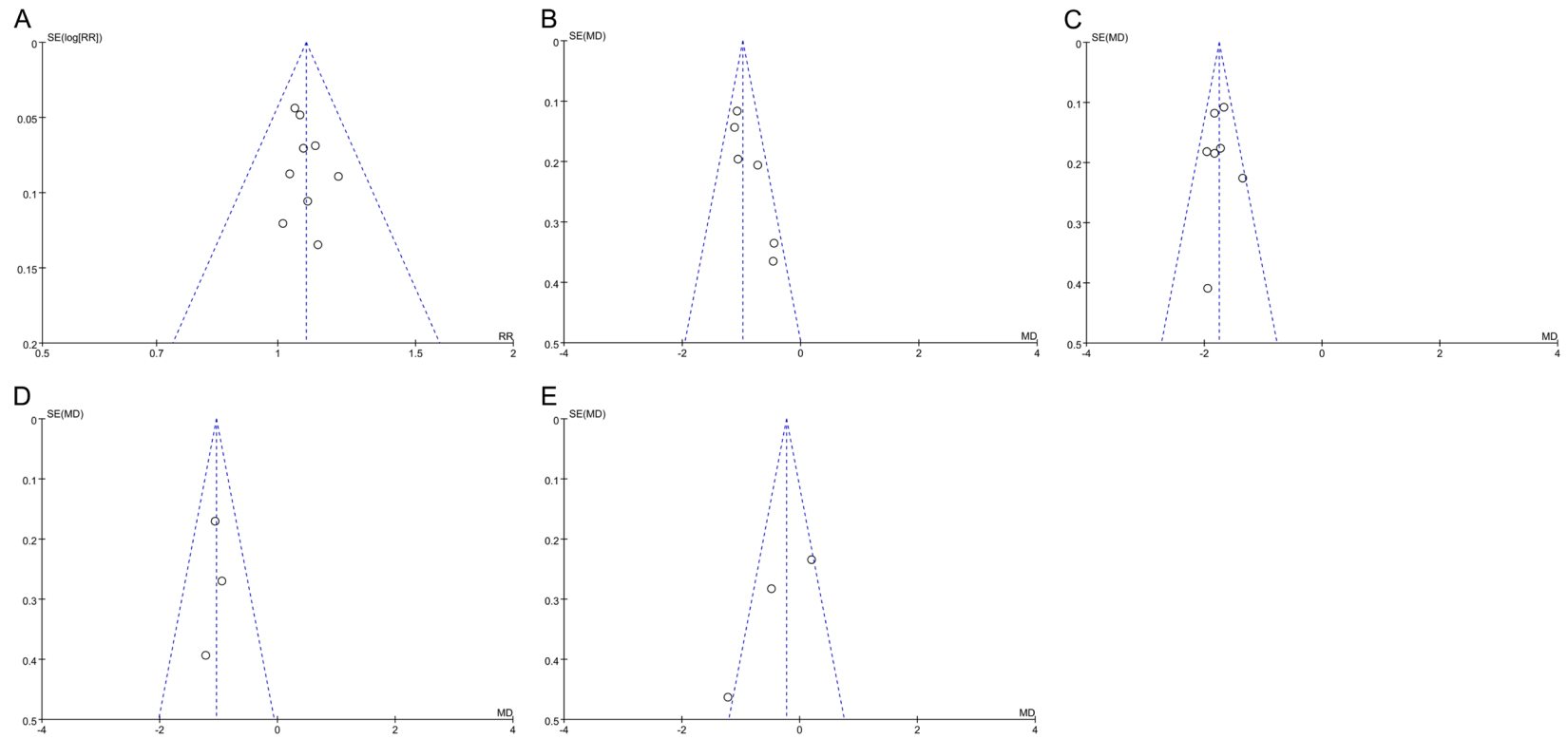


Figure 8. The funnel plots for included studies in each meta-analysis. A. Funnel plots of studies on the clinical efficacy; B. Funnel plots of studies on the VAS score; C. Funnel plots of studies on the symptom scores; D. Funnel plots of studies on the TCM syndrome scores; E. Funnel plots of studies on the Lysholm scores.

alone in terms of pain reduction, improving joint function, and enhancing overall quality of life when compared to needle-knife therapy alone. The integrated approach not only speeds up the alleviation of symptoms but also diminishes patient distress, thereby enhancing their quality of life.

The analysis of clinical efficacy in nine RCTs indicates that the concurrent use of needle knife therapy and CHM results in superior clinical efficacy compared to needle knife therapy used alone for the treatment of KOA [RR = 1.09; 95% CI: (1.03, 1.14); P = 0.002]. This systematic review highlights the potential benefits of integrating CHM with conventional medical treatments to achieve a more comprehensive management of KOA. By targeting both local knee inflammation and systemic symptoms, the synergistic combination of needle knife therapy, which is recognized for its capacity to promote blood circulation and the body's healing processes, and CHM, which addresses systemic functions and inflammation, demonstrates an enhanced therapeutic effect [17]. This analysis provides valuable evidence supporting the viability of this combination therapy as a treatment option for KOA patients. The findings underscore the importance of combining Western medicine with traditional medical wisdom, reinforcing the theoretical foundations that support the application of needle-knife therapy and the use of Chinese herbal remedies.

Analysis of the VAS scores for knee pain in patients with KOA demonstrates a significant decrease in pain levels among those who received a combination of needle-knife treatment and Chinese herbal medicine, compared to the control group [RR = -0.98; 95% CI: -1.12, -0.84; P < 0.00001]. The notable reduction in VAS scores suggests that this integrative therapeutic approach may be beneficial in improving pain management for KOA patients. Furthermore, a review of seven RCTs focusing on overall symptom scores has shown a significant decrease in the severity of symptoms for patients who underwent the combined therapy, in contrast to the control group. This evidence suggests that the combination of needle-knife therapy and CHM can effectively alleviate the primary symptoms of KOA, such as joint pain, swelling, and restricted movement. The substantial decline in symptom scores implies that

this treatment regimen has a significant impact on improving the general health and well-being of KOA patients. These findings highlight the potential of this approach to significantly improve the quality of life for KOA patients by reducing their pain and related symptoms.

TCM syndrome scores are a method used to assess symptoms and the pathogenesis of diseases based on TCM theory [18]. Our meta-analysis results revealed no significant difference in TCM syndrome scores between the combination group and the control group. On the other hand, Lysholm scores are a comprehensive scoring system utilized to evaluate knee function, encompassing elements such as joint range of motion, pain levels, daily living activities, and work ability [19]. Our findings indicated a significant improvement in Lysholm scores in the treatment group compared to the control group. This suggests that the combined treatment may have exerted a notable positive influence on knee function and pain reduction in patients with KOA. Although TCM syndrome scores did not exhibit a significant variation, the improvement in Lysholm scores implied a considerable amelioration in knee function and pain for the combined treatment group. These findings imply that an integrated treatment strategy may be advantageous for KOA patients. Nevertheless, further studies are needed to confirm these findings and to clarify the exact mechanisms involved in the action.

It is crucial to note the limitations of the study, such as the potential for heterogeneity among the trials included in the analysis and the likelihood that the results may not be applicable to all KOA patients. Additionally, the study does not provide insights into the duration of pain relief or the long-term outcomes of the combination therapy. There are variations in treatment courses among the included studies, which could affect the evaluation results. The timing of outcome evaluations was not uniform across the different studies. When data was extracted, the information from the final follow-up visit was chosen, which might also introduce some bias into the assessment results.

In conclusion, the results of this analysis provide robust evidence that the combination of needle knife therapy with Chinese herbal medicine is an effective treatment option for alleviating the symptoms of KOA. These results high-

light the potential of this integrated approach to markedly improve the quality of life for KOA patients by mitigating joint pain, reducing swelling, and enhancing joint mobility.

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Disclosure of conflict of interest

None.

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