

Meta-Analysis of the Early Treatment of Patients After Knee Arthroplasty by Internal Administration of TCM Combined with Western Conventional Therapies

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ARTICLE INFO

Received:  July 09, 2025

Published:  July 18, 2025

Citation: Zi-Hao Lan, Zhi-Peng Mu, Yong-hao Chuan, Chen Xue, Chun-Meng Yang and Hong-Jian Li. Meta-Analysis of the Early Treatment of Patients After Knee Arthroplasty by Internal Administration of TCM Combined with Western Conventional Therapies. Biomed J Sci & Tech Res 62(4)-2025. BJSTR. MS.ID.009784.

ABSTRACT

Objective: To evaluate the effectiveness of internal administration of Traditional Chinese Medicine (TCM) combined with Conventional Western Medicine Treatment (CWMT) in the early treatment of patients after knee arthroplasty

Methods: The databases were searched by computer, and the quality of the literature was evaluated by Cochrane bias risk assessment form. Meta-analysis was performed by Revman 5.4 software. In the included studies, TCM + CWMT was used in the observation group and CWMT alone was used in the control group;

Results: At 3 days postoperatively: the VAS score [MD= -0.67, 95% CI (-0.89, -0.46), Z=6.1, P<0.00001], ROM [MD= 4.25, 95% CI (1.82, 6.67), Z=3.44, P=0.0006], the HHS score [MD= 1.77, 95% CI (0.29, 3.26), Z=2.34, P=0.02], CRP index [MD= -10.69, 95% CI (-15.68, -5.71), Z=4.20, P<0.0001]; and at 7 days postoperatively: the VAS score [MD= -0.58, 95% CI (-0.78, -0.37), Z=5.55, P<0.00001], ROM [MD= 5.33, 95% CI (2.83, 7.83), Z=4.17, P<0.0001], HHS score [MD= 3.23, 95% CI (2.32, 4.13), Z=7.00, P<0.00001], CRP index [MD= -6.41, 95% CI (-9.15, -3.68), Z= 4.60, P<0.00001]; 14 days postoperatively: the VAS score [MD= -6.41, 95% CI (-9.15, -3.68), Z=4.60, P<0.00001], ROM [MD= 4.14, 95% CI (2.97, 5.30), Z=6.97, P<0.00001], the HHS score [MD= 3.48, 95% CI (2.92, 4.04), Z=12.20, P<0.00001], CRP index [MD= -3.08, 95% CI (-3.29, -2.87), Z=28.98, P<0.00001]

Conclusion: TCM + CWMT has a significant early effect on patients after knee arthroplasty. It is superior to CWMT alone in pain relief, joint mobility recovery, knee function score improvement and C-reactive protein index improvement.

Keywords: Internal Chinese Medicine; Conventional Western Medicine; Postoperative Knee Arthroplasty; Meta-Analysis

Introduction

In the field of modern orthopedic medicine, total knee arthroplasty (TKA / Unicompartmental Knee Arthroplasty, UKA), as a key means of treating end-stage knee joint diseases [1], has brought hope to improve the quality of life for many patients suffering from knee joint pain and dysfunction. However, early postoperative pain management, joint function recovery, and inflammation control are still severe challenges for clinicians and patients [2]. In the early stage

after knee joint surgery, western medicine has a systematic method to deal with pain management, joint function recovery and inflammation control, but the disadvantages are obvious. In pain management, non-steroidal anti-inflammatory drugs such as acetaminophen, selective cyclooxygenase-2 inhibitors and other drugs have the risk of gastrointestinal [3], liver and kidney injury. Opioids have the disadvantages of addiction and respiratory depression, and the efficacy of local anesthesia is short. In terms of inflammation control, antibiotic abuse leads to drug-resistant bacteria, and glucocorticoids cause

many adverse reactions [4]. However, with the gradual emergence of traditional Chinese medicine in multidisciplinary diagnosis and treatment, its unique overall conditioning, syndrome differentiation and treatment concepts and methods have been gradually introduced into the early treatment process after knee arthroplasty [5], trying to overcome the above thorny issues. In recent years, there has been no lack of research on the application of traditional Chinese medicine in the early treatment of patients after knee arthroplasty, highlighting the efficacy of traditional Chinese medicine in postoperative pain management, functional recovery, inflammation control and other aspects [6].

Shaopeng Chen, et al. [7] found that the application of Shujin Huoxue Decoction combined with traditional Chinese medicine massage can better restore the knee function and lower limb muscle strength of postoperative patients, while reducing the incidence of postoperative complications; Xianglei Li, et al. [8] found that the application of Duhuo Jisheng Decoction combined with conventional rehabilitation therapies can significantly improve the postoperative inflammatory indicators, relieve pain and improve lower limb function. However, there are significant differences in the dimensions of sample size, experimental design, intervention methods, observation duration and so on, which leads to the uneven universality and persuasiveness of the research conclusions. Therefore, in this paper, the author will systematically sort out and rigorously evaluate the relevant literature, aiming to accurately reveal the effectiveness of traditional Chinese medicine in the early treatment of patients after knee arthroplasty, and provide strong data support and scientific guidance for optimizing clinical practice and expanding the treatment path of integrated traditional Chinese and Western medicine.

Methods

Search Strategy

Computerized searches were performed on China Knowledge Network (CNKI), Wan Fang Database, VIP Database, and Pub Med on randomized controlled trial (RCT) on the application of traditional Chinese medicine in the early treatment of patients after knee arthroplasty, with a search time span was from the construction of each database to November 2024. The search was conducted by using the method of subject words + free words, and the Chinese search keywords: "Chinese medicine", "traditional Chinese medicine", "Chinese medicine", "Chinese medicine treatment", "Chinese medicine treatment", "Chinese medicine internal", "Chinese medicine soup", "combined Chinese medicine", "Knee replacement", "Knee replacement", "Artificial knee", "Artificial knee arthroplasty", "Post Knee Replacement", "Post Knee Replacement Pain", "Post Knee Replacement Function", "Post-arthroplasty rehabilitation", "Knee function"; English search terms: "Arthroplasties, Replacement, Knee", "Arthroplasty, Knee Replacement", "Total Knee Replacement", "Knee Replacement, Total", "Arthroplasties, Knee Replacement", "Unicompartmental Knee Arthroplasty", "Arthroplasty, Unicompartmental Knee", "Zhong Yi Xue", "Traditional Medi-

cine, Chinese", "Traditional Medicine Chinese", "Traditional Chinese Medicine".

Study Inclusion Criteria

1. Type of study: clinical RCT
2. Objects: patients after knee arthroplasty, including total knee arthroplasty (TKA) and unicondylar knee arthroplasty (UKA)
3. Intervention and timing: traditional Chinese medicine combined with conventional Western medicine in the observation group and conventional Western medicine alone in the control group, both implemented on the day of the operation
4. Outcome indexes included at least two of the following four indexes: Visual Analogue Scale (VAS) [9], Range of Motion (ROM), Hospital for Special Surgery Knee Score (HSS) [10], and C-Reactive Protein Index (CRP)
5. Literature quality: based on the Cochrane Risk of Bias Assessment Tool [11], the literature of grade B and above was included;
6. Chinese or English literature.

Study Exclusion Criteria

1. Excessive differences in interventions;
2. Duplication of literature;
3. Inability to search for the original text;
4. Non-randomized controlled studies such as animal studies, individual case reports, and systematic evaluations; and
5. Missing endpoint indicators, and obvious errors or incompleteness of data.

Study Screening and Data Extraction

Literature collation was carried out by two separate researchers who carried out the screening process independently. In case of disagreement about the screening process or the results, it was resolved through third-party discussions. Data were extracted by the researchers from the finalized literature, including title, author, year, sample size, duration of illness, duration of treatment, interventions, and outcome indicators.

Assessment of Study Quality

The quality of the final included literature was assessed according to the Cochrane Risk of Bias Assessment Tool, which consists of seven entries: Random sequence generation (selection bias), Allocation concealment (selection bias), Blinding of participants and personnel (performance bias), Blinding of outcome assessment (detection bias), Incomplete outcome data (attrition bias), Selective reporting (reporting bias), Other bias. The degree of literature bias was categorized

into three grades: low risk, unclear and high risk, and was represented by a risk of bias assessment diagram. If each bias assessment criterion was low risk, the quality of literature was graded as A. If part of the assessment was low risk, it was graded as B. If all the assessments were high risk, it was graded as C. The quality of literature was assessed by a third-party discussion, and the quality of literature was assessed by a third-party discussion. Disagreements on the assessment results were resolved through third-party discussions.

Statistical Methods

Meta-analysis was performed by using RevMan5.4 software. According to the results of heterogeneity test, if $P \geq 0.05$ and $I^2 \leq 50\%$, it suggests that the homogeneity among the included studies is good, and the fixed effect model was chosen; if $P < 0.05$ and $I^2 > 50\%$, it suggests that there is a large heterogeneity among the included studies, and the random effect model was chosen. For the indicators with significant heterogeneity among studies ($P < 0.05$, $I^2 \geq 70\%$), sensitivity analysis was conducted to explore the source of heterogeneity, and after excluding heterogeneity, the corresponding effect model was

selected to re-conduct Meta-analysis and test the stability of the analysis results. The indicators were all continuous variables, and were analyzed by Mean Deviation (MD); the point estimates and 95% Confidence Intervals (CI) of each effect were given, and the difference was considered statistically significant at $P < 0.05$; for the outcome indicators, the funnel plots were used to evaluate whether there was any publication bias if 10 or more papers were included in the study.

Result

Literature Selection

We searched the database to obtain 1326 articles, including 1102 articles in Chinese and 224 articles in English. 362 duplicates were excluded by using Note Express software, 585 irrelevant articles were excluded by analyzing the titles and keywords, 295 articles were excluded by reading the abstracts, and 84 articles were screened for the need to read the full text. According to the requirements of inclusion and exclusion criteria, interventions and outcome indicators, 22 papers were finally included, and the screening process is shown in Figure 1.

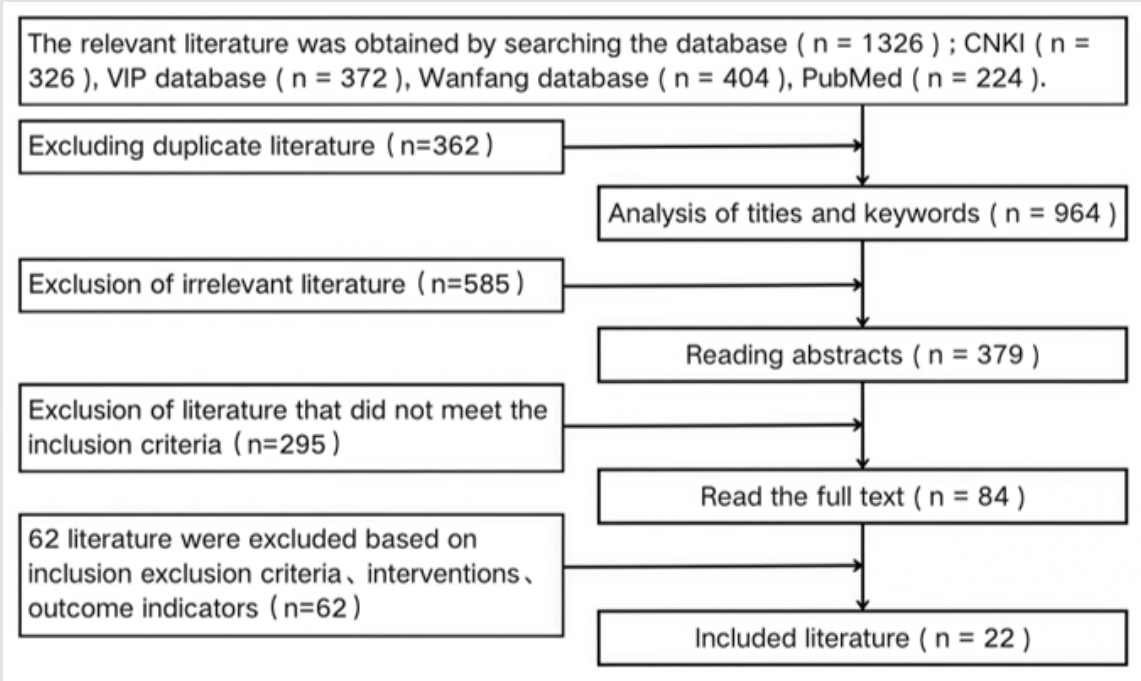


Figure 1: Literature screening process.

Basic Characteristics of the Included Studies

A total of 22 randomized controlled trial studies [12-33] from the

literature were included, involving a sample size of 1563, as detailed in the Table of Basic Characteristics of Included Literature (Table 1).

Table 1.

Author (year)	Surgery	Observation Group		Control Group		TCM in Observation Group	Outcome indicator
		Sample size	intervention	Sample size	intervention		
Xiao [12]	TKA	35	TCM+ CWMT	35	CWMT	Sanqi Zhixue Decoction	①③④
Zhan [13]	TKA	27	TCM+ CWMT	26	CWMT	Danqi Niuren Bazhen Decoction	①④
Chen [14]	TKA	30	TCM+ CWMT	30	CWMT	Fuyuan Huoxue Decoction	①④
Zhang [15]	TKA	30	TCM+ CWMT	30	CWMT	Taohong Siwu Decoction	①②③
Liu [16]	UKA	18	TCM+ CWMT	18	CWMT	Taohong Siwu Decoction	①②③
Xing [17]	TKA	40	TCM+ CWMT	39	CWMT	Xiaozhong Jianbu Decoction	①②④
Liu [18]	TKA	23	TCM+ CWMT	23	CWMT	Yiqi Huoxue Decoction	①③
Luo [19]	TKA	30	TCM+ CWMT	30	CWMT	Shujin Huoxue Decoction	①②
Luo [20]	TKA	30	TCM+ CWMT	30	CWMT	Shujin Huoxue Decoction	①②③
Tang [21]	TKA	90	TCM+ CWMT	90	CWMT	Shentong Zhuyu Decoction	①②③
Wang [22]	TKA	30	TCM+ CWMT	30	CWMT	Shentong Zhuyu Decoction	①③
Xiong [23]	TKA	43	TCM+ CWMT	42	CWMT	Danqi Niuren Bazhen Decoction	①③④
Zhang [24]	TKA	45	TCM+ CWMT	45	CWMT	Siwu Zhentong Decoction	①③
Han [25]	TKA	30	TCM+ CWMT	30	CWMT	Zhang’s Shujin Tongluo Decoction	①②③
Guan [26]	TKA	33	TCM+ CWMT	33	CWMT	Shentong Zhuyu Decoction	①④
Jiang [27]	TKA	30	TCM+ CWMT	30	CWMT	Shujin Huoxue Decoction	①②③
Xu [28]	TKA	29	TCM+ CWMT	31	CWMT	Taohong Siwu Decoction Combined with Wuwei Xiaodu Yin	①②④
Hu [29]	TKA	41	TCM+ CWMT	43	CWMT	Taohong Siwu Decoction Combined with Wuling San	②④
Wang [30]	TKA	40	TCM+ CWMT	40	CWMT	Huoxue Xiaozhong Decoction	③④
Li [31]	TKA	35	TCM+ CWMT	35	CWMT	Huoxue Shugan Decoction	①②
Zhou [32]	UKA	41	TCM+ CWMT	41	CWMT	Huoxue Gufu Decoction	①③
Shen [33]	TKA	31	TCM+ CWMT	31	CWMT	Duhuo Jisheng Decoction Granules	①③④

Note: TCM: Traditional Chinese Medicine; CWMT: Conventional Western Medicine therapies

1.

Visual Analogue Scale, VAS;
2.

Range of Motion, ROM;
3.

Hospital for Special Surgery Knee Score, HSS;
4.

C-reactive protein, CRP

Methodological Evaluation

Of the 22 included studies [12-33], 21 RCTs [12,14-33] used the random number table method to generate a randomized sequence, evaluated as low risk, and one paper [13] only mentioned randomization and did not specify the exact method used, evaluated as unclear; of the 22 included studies [12-33], three RCTs [15,20,22] used sealed, opaque envelopes to dispense patient grouping information, rated as low risk, and the remaining 19 studies [12-14,16-19,21,23-33] did not describe the implementation of distribution concealment, rated as unclear; all 22 included studies [12-33] were evaluated as

unclear by mentioning the blinding of patients and relevant researchers during the implementation and outcome assessment phases; Data from the 22 included studies [12-33] were consistent with the general information mentioned, all outcome indicators of interest in the systematic evaluation were reported in the results, the outcome data were complete, and the assessment was low risk; none of the 22 included studies [12-33] could determine whether there was selective bias and other biases, and were evaluated as unclear; the quality of the study grades of the 22 included papers [12-33] was evaluated as grade B. For details, see Figure 2.

	Chen2020	Guan2021	Han2023	Hu2020	Jiang2024	Li2016	Liu2018	Liu2021	Luo2019	Luo2020	Shen2022	Tang2018	Wang2013	Wang2022	Xiao2021	Xing2024	Xiong2018	Xu2015	Zhan2019	Zhang2017	Zhang2022	Zhou2024
Random sequence generation (selection bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Allocation concealment (selection bias)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Blinding of participants and personnel (performance bias)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Blinding of outcome assessment (detection bias)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Incomplete outcome data (attrition bias)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Selective reporting (reporting bias)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Other bias	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

Figure 2: Evaluation of the quality of studies included in the literature.

Outcomes and Efficacy Evaluation

In order to more accurately assess the effectiveness of applying traditional Chinese medicine in the early functional rehabilitation of postoperative knee arthroplasty patients, the author monitored the VAS, ROM, HHS, and CRP indexes on the 3rd, 7th, and 14th postoperative days, respectively.

3 Days Postoperatively

VAS Score: A total of 19 studies [12-28,31,33] described the

VAS scores of patients 3 days after knee arthroplasty, with high inter-study heterogeneity ($P<0.00001,I^2=90\%$), and a random-effects model was chosen, with a combined-effects test[MD= -0.67,95%CI (-0.89,-0.46), $Z= 6.1,P<0.00001$], which was statistically significant, indicating that the application of traditional Chinese medicine could further relieve the pain of patients 3 days after knee arthroplasty based on the original conventional therapies of Western medicine. The inverted funnel plots were basically symmetrical, suggesting that the possibility of publication bias is small and the results are reliable (Figure 3).

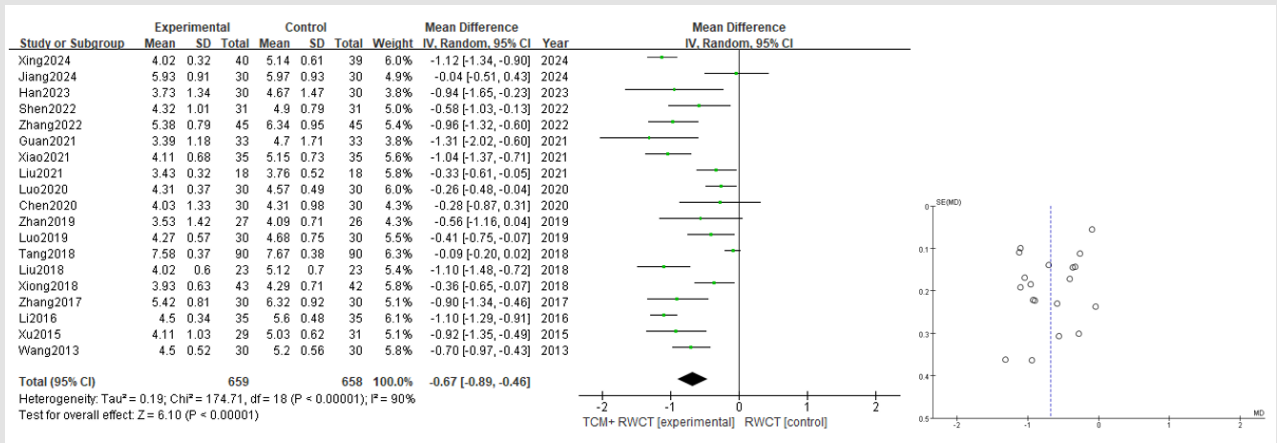


Figure 3: Forest plot and funnel plot of VAS score at 3 days postoperatively.

Range of Motion: A total of 8 studies [15,17,19-21,28,29,31] described the ROM of patients 3 days after knee arthroplasty, and the results suggested high inter-study heterogeneity ($P<0.00001,I^2=96\%$), and the selection of the random-effects model with the test of the combined effect value [MD= 4.25,95%CI (1.82,6.67), $Z= 3.44,P=0.0006$],

was statistically significant, indicating that the application of Chinese medicine could further restore the joint movement of patients 3 days after knee arthroplasty based on the original conventional therapies of Western medicine (Figure 4).

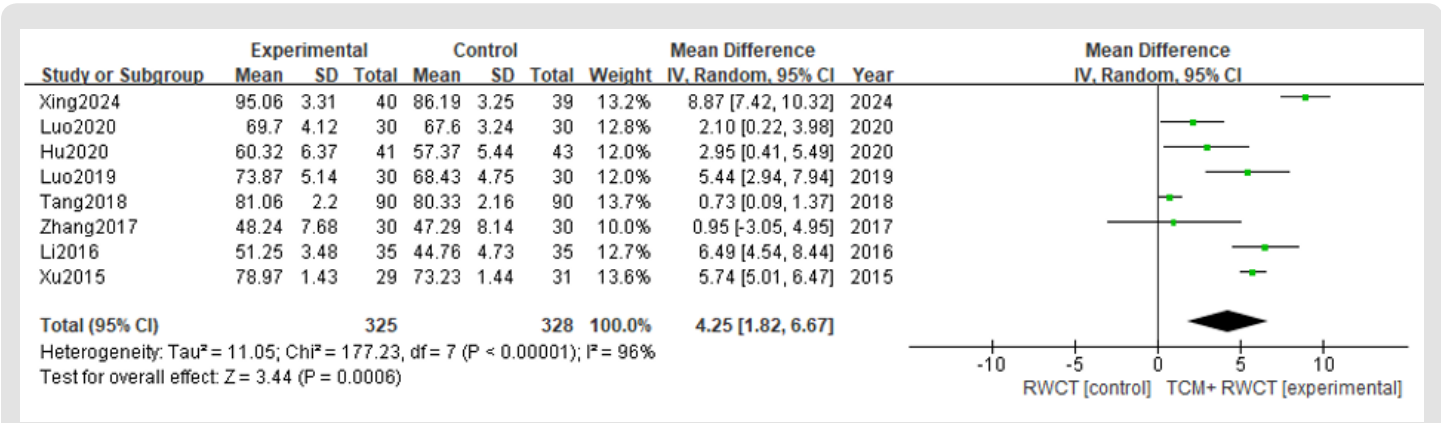


Figure 4: ROM forest plot at 3 days postoperatively.

HSS Score: A total of 7 studies [15,18,20,22-24,33] described the HHS scores of patients 3 days after knee arthroplasty, and the results of the heterogeneity test suggested a high degree of heterogeneity ($P < 0.00001$, $I^2 = 88\%$), and the random-effects model was selected, and the test of the combined effects value [$MD = 1.77, 95\%CI$ (0.29,3.26), $Z = 2.34, P = 0.02$], which was statistically significant, indicating that the application of traditional Chinese medicine could further improve the joint function of patients 3 days after knee arthroplasty on the basis of the original conventional therapies in Western medicine (Figure 5).

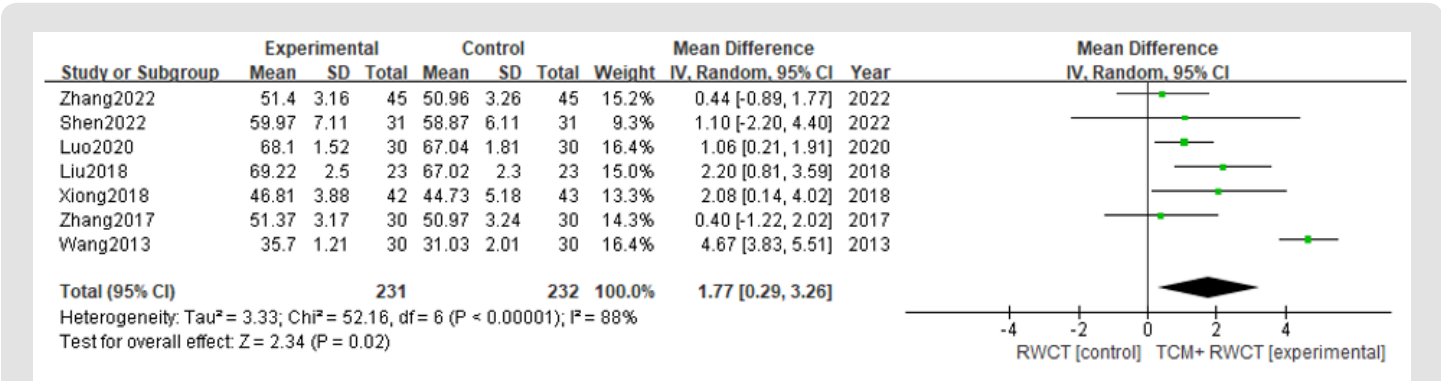


Figure 5: Forest plot of HHS score at 3 days postoperatively.

C-Reactive Protein Index: A total of 9 studies [12-14,17,23,26,28,29,33] described the CRP indexes of patients 3 days after knee arthroplasty, and the test of heterogeneity suggested high heterogeneity ($P < 0.00001$, $I^2 = 96\%$), and the random effect model was selected, and the test of the combined effect value [$MD = -10.69, 95\%CI$ (-15.68,-5.71), $Z = 4.20, P < 0.0001$], was statistically significant, indicating that the application of traditional Chinese medicine could be a good alternative to the original Western medicine routine treatment (Figure 6).

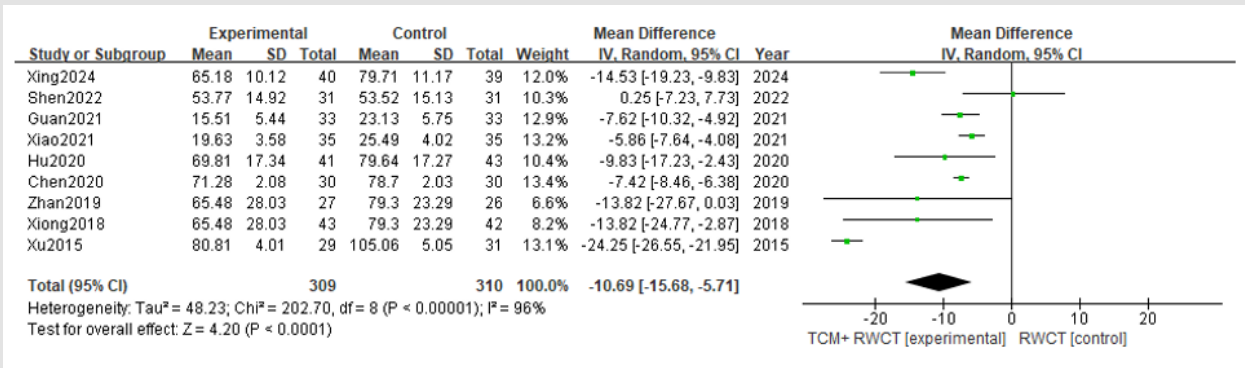


Figure 6: Forest plot of CRP index at 3 days postoperatively.

7 Days Postoperatively

VAS Score: A total of 19 studies [12-28,31,33] described the VAS scores of patients 7 days after knee arthroplasty, with high heterogeneity among studies ($P < 0.00001$, $I^2 = 92\%$), and a random-effects model was chosen, and the combined-effects test [$MD = -0.58$, $95\%CI (-0.78, -0.37)$, $Z = 5.55$, $P < 0.00001$], was statistically significant, indi-

cating that the application of traditional Chinese medicine could further alleviate the pain of patients 7 days after knee arthroplasty on the basis of the original conventional therapies by western medicine. The inverted funnel plots were basically symmetrical, suggesting that the possibility of publication bias is small and the results are reliable (Figure 7).

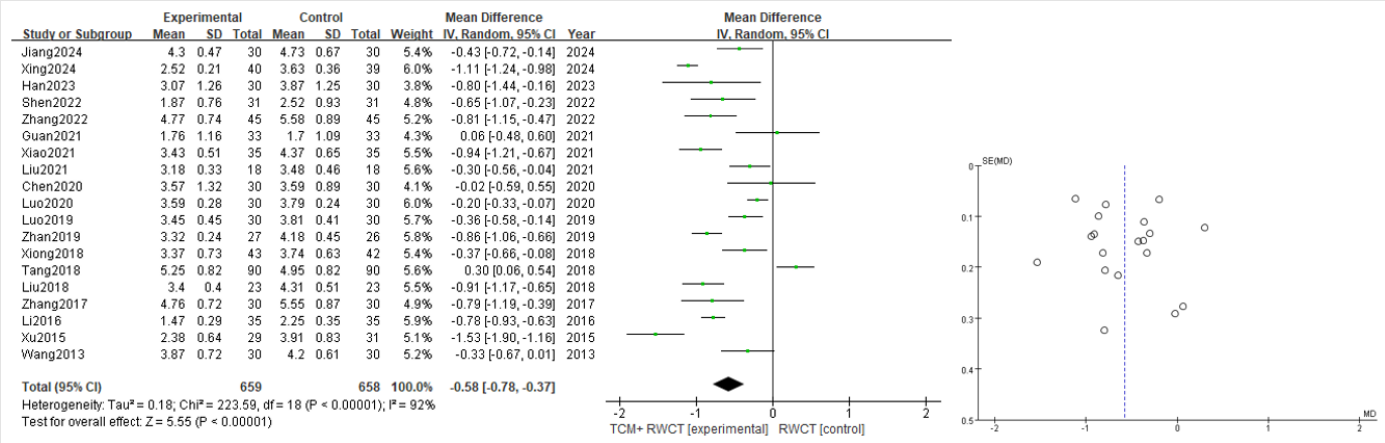


Figure 7: Forest plot and funnel plot of VAS score at 7 days postoperatively.

Range of Motion: A total of 11 studies [15-17,19-21,25,27-29,31] described the ROM of patients 7 days after knee arthroplasty, suggesting a high degree of heterogeneity among the studies ($P < 0.00001$, $I^2 = 97\%$), and the random-effects model was selected, and the combined-effects value test [$MD = 5.33$, $95\%CI (2.83, 7.83)$, $Z = 4.17$, $P < 0.0001$] was statistically significant, indicating that the appli-

cation of traditional Chinese medicine can further restore the ROM in patients after knee arthroplasty based on the original Western medicine conventional therapies. The inverted funnel plots were basically symmetrical, suggesting that the possibility of publication bias is small and the results are reliable (Figure 8).

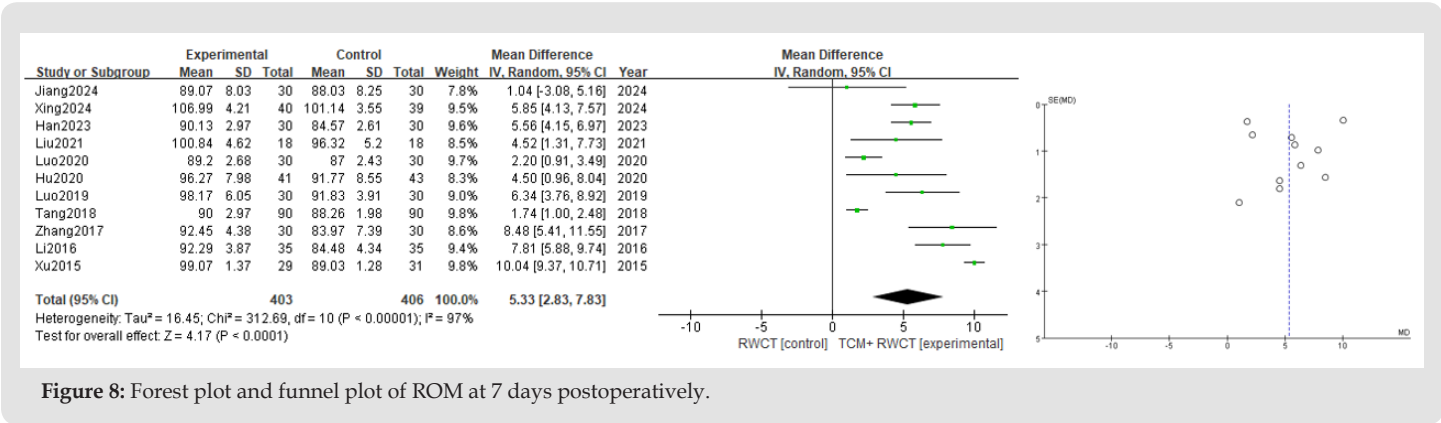


Figure 8: Forest plot and funnel plot of ROM at 7 days postoperatively.

HSS Score: A total of 10 studies [15,16,18,20,22-25,27,33] described the HSS scores of patients 7 days after knee arthroplasty, and the results suggested that there was high heterogeneity among the studies ($P=0.0003, I^2=71\%$), and the selection of the random-effects model and the test of the combined effect value [$MD= 3.23, 95\%CI (2.32, 4.13), Z= 7.00, P<0.00001$], which was statistically significant,

indicating that the application of traditional Chinese medicine could further improve the joint function of patients 7 days after knee arthroplasty on the basis of the original conventional western medical treatment. The inverted funnel plot suggests that the left-right symmetry is not complete, and there may be publication bias (Figure 9).

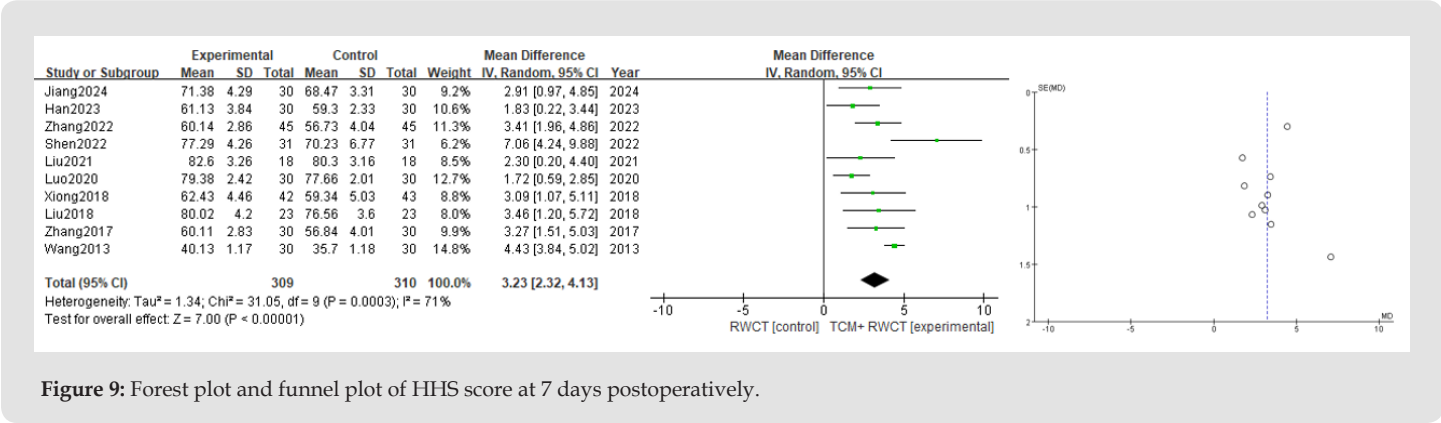


Figure 9: Forest plot and funnel plot of HHS score at 7 days postoperatively.

C-Reactive Protein Index: A total of 8 studies [13,14,17,23,26,28,29,33] described the CRP indexes of patients 7 days after knee arthroplasty, and the results of the heterogeneity test showed that there was high heterogeneity among studies ($P<0.00001, I^2=95\%$), and a random-effects model was selected, and the combined-effects-value test [$MD= -6.41, 95\%CI (-9.15, -3.68), Z=$

$4.60, P<0.00001$], which was statistically significant, indicating that the application of traditional Chinese medicine could further reduce the CRP index of patients 7 days after knee arthroplasty on the basis of the original conventional therapies of Western medicine (Figure 10).

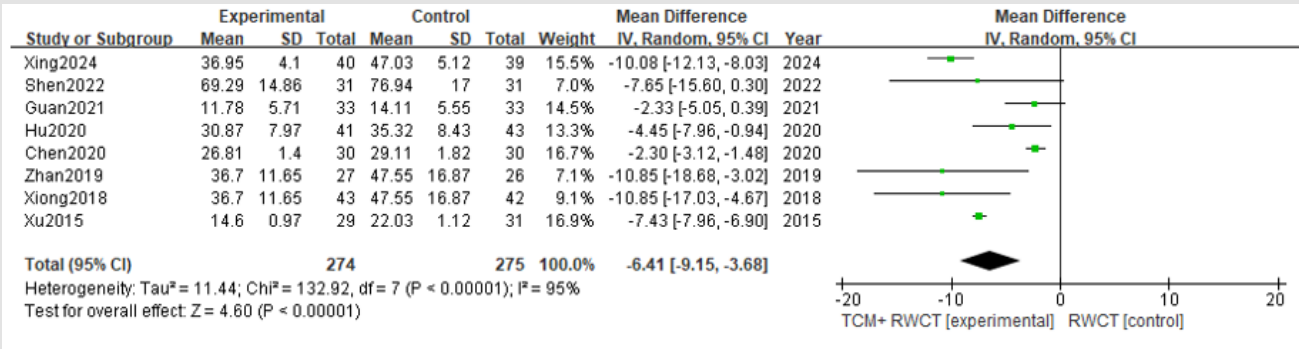


Figure 10: Forest plot of CRP index at 7 days postoperatively.

14 Days Postoperatively:

VAS Score: A total of 15 studies [12-16,18-21,23-28] described the VAS scores of patients 14 days after knee arthroplasty. The results of the heterogeneity test showed high heterogeneity among studies($P<0.00001,I^2=89\%$).The random effect model was selected, and the test of the combined effect value[MD= -0.63,95%CI (-0.83,-

0.44), $Z= 6.34,P<0.00001$], statistically significant. It indicates that the application of traditional Chinese medicine can further relieve the pain of the patients 14 days after knee arthroplasty on the basis of the original conventional therapies of western medicine. The inverted funnel plot is basically symmetrical, suggesting that the possibility of publication bias is small and the results are reliable (Figure 11).

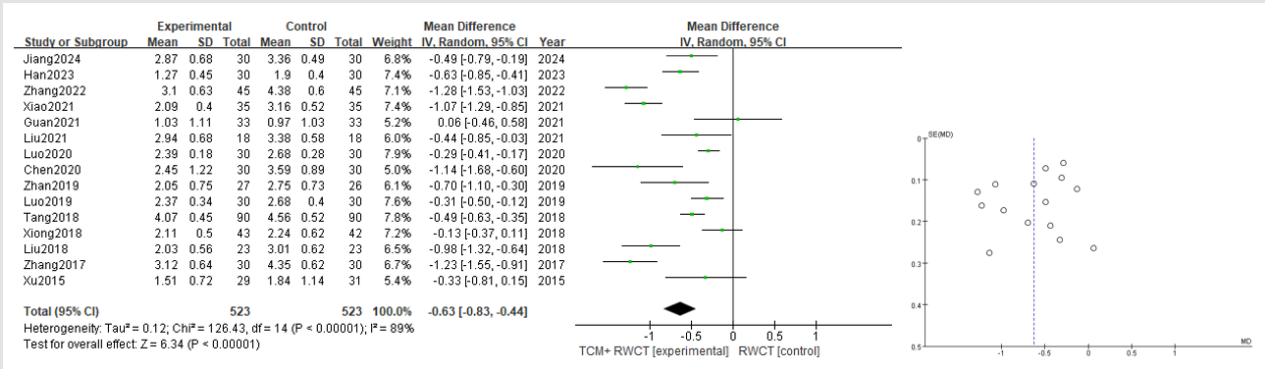


Figure 11: Forest plot and funnel plot of VAS score at 14 days postoperatively.

Range of Motion: A total of 9 studies [15,16,19-21,25,27-29] described ROM in patients 14 days after knee arthroplasty. The results of heterogeneity test showed high heterogeneity among studies ($P=0.0005,I^2=71\%$).The random-effects model was chosen, and the test of the combined effects value [MD= 4.14, 95%CI (2.97,5.30), $Z=$

6.97, $P<0.00001$], statistically significant. It shows that the application of traditional Chinese medicine can further restore the joint mobility of patients 14 days after knee arthroplasty on the basis of the original conventional therapies with Western medicine (Figure 12).

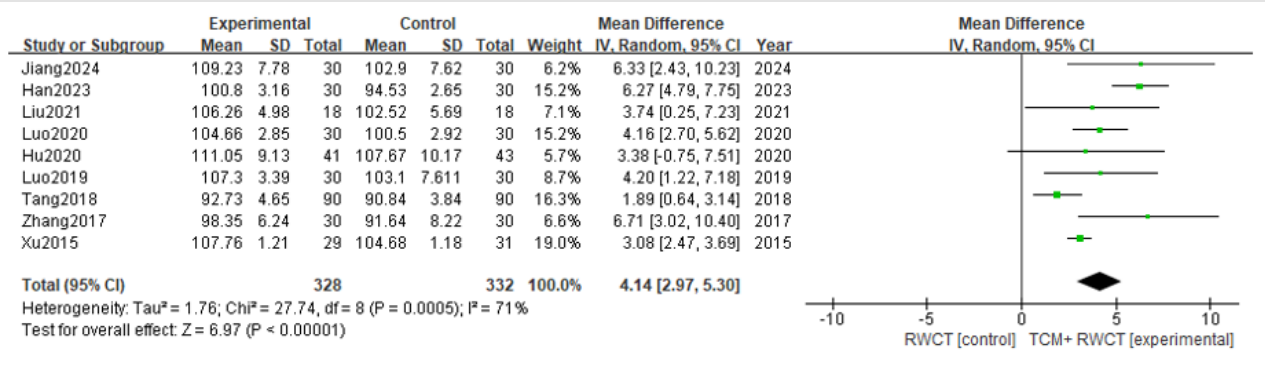


Figure 12: ROM forest plot at 14 days postoperatively.

HSS Score: A total of 10 studies [12,15,16,18,20,23,23-25,27,30] described the HHS scores of patients at 14 days after knee arthroplasty. The results of the heterogeneity test showed good homogeneity among the studies ($P=0.08, I^2=42\%$), and the selection of a fixed-effects model with a combined-effects-value test [$MD= 3.48$, 95%CI (2.92,4.04), $Z= 12.20, P<0.00001$], statistically significant. This result

suggests that the application of traditional Chinese medicine can further improve the joint function of patients 14 days after knee arthroplasty on the basis of the original conventional therapies with Western medicine. The inverted funnel diagram suggests that the left-right symmetry is not complete and there may be publication bias (Figure 13).

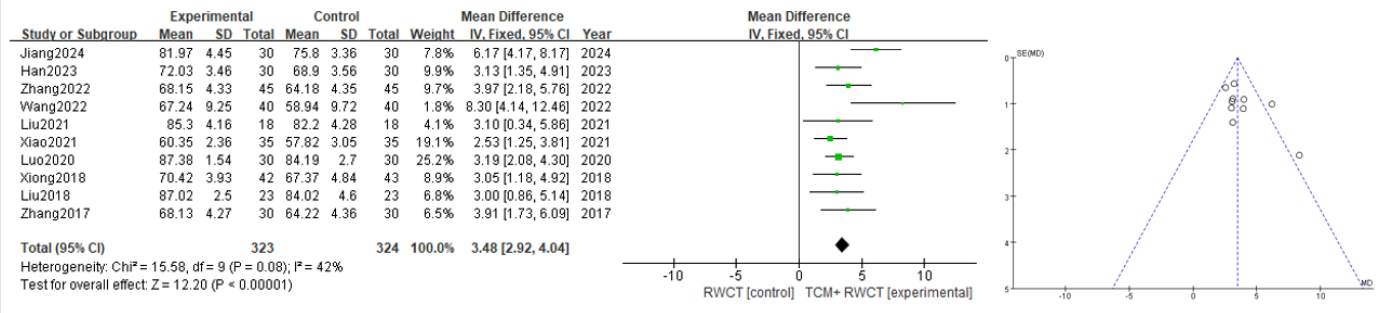


Figure 13: Forest plot and funnel plot of HSS score at 14 days postoperatively.

C-Reactive Protein Index: A total of 6 studies [13,14,23,28-30] described the CRP indexes of patients 14 days after knee arthroplasty, and the results of the heterogeneity test showed that the homogeneity among the studies was good ($P=0.21, I^2=30\%$), and the fixed-effects model was selected, and the test of the combined effects [$MD=$

-3.08 , 95%CI (-3.29,-2.87), $Z= 28.98, P<0.00001$] was statistically significant. The results showed that the application of traditional Chinese medicine was able to further reduce the CRP index of patients 14 days after knee arthroplasty on the basis of the original conventional therapies with Western medicine (Figure 14).

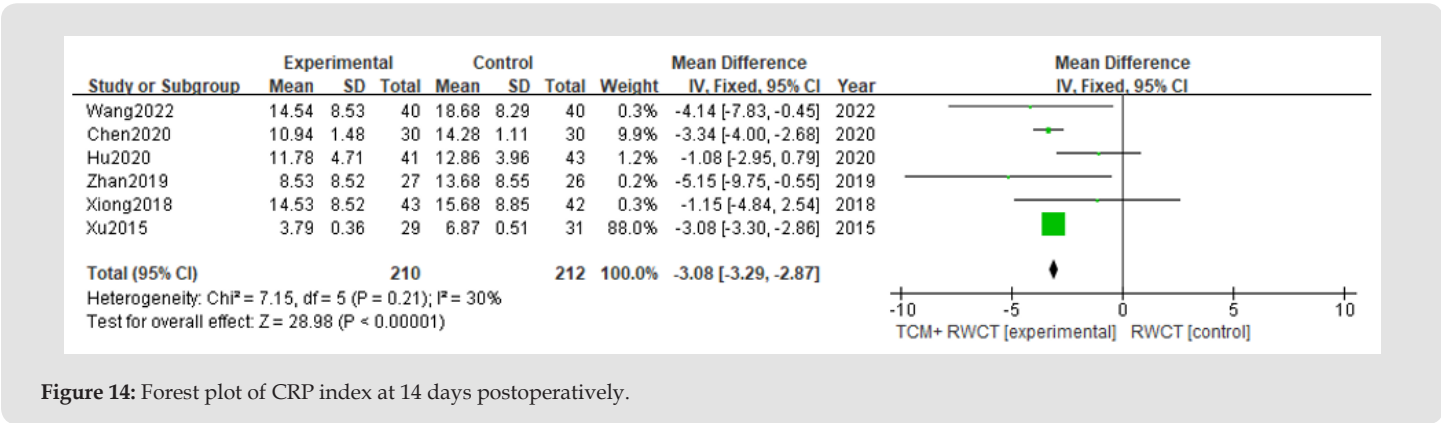


Figure 14: Forest plot of CRP index at 14 days postoperatively.

Sensitivity Analysis

The heterogeneity test revealed that there was a high degree of heterogeneity between the 3-day postoperative and 7-day postoperative observations and the 14-day postoperative VAS scores and the ROM study, and sensitivity analyses were performed by using the study-by-study exclusion method and the transformed-effects model.

eling method. After careful comparison, the combined effect values and 95% confidence intervals obtained after the exclusion of individual studies were very little different from the original results, and the combined effect values and their intervals changed little after the transformation of the effect model, suggesting that the results of this Meta-analysis were robust and highly reliable. For details, please refer to the table of sensitivity analysis results (Table 2).

Table 2: Sensitivity analysis results [MD (95% CI)].

Indicators of Study Outcomes	Fixed-Effects Model	Random-Effects Model
VAS score at 3 days postoperatively	-0.52 [-0.58, -0.46]	-0.67 [-0.89, -0.46]
ROM at 3 days postoperatively	3.58 [3.16, 3.99]	4.25 [1.82, 6.67]
HHS score at 3 days postoperatively	2.22 [1.76, 2.68]	1.77 [0.29, 3.26]
CRP indicator at 3 days postoperatively	-9.25 [-10.02, -8.47]	-10.69 [-15.68, -5.71]
VAS score at 7 days postoperatively	-0.61 [-0.67, -0.56]	-0.58 [-0.78, -0.37]
ROM at 7 days postoperatively	5.81 [5.41, 6.21]	5.33 [2.83, 7.83]
HHS score at 7 days postoperatively	3.56 [3.15, 3.98]	3.23 [2.32, 4.13]
CRP indicator at 7 days postoperatively	-6.04 [-6.46, -5.61]	-6.41 [-9.15, -3.68]
VAS score at 14 days postoperatively	-0.54 [-0.60, -0.48]	-0.63 [-0.83, -0.44]
ROM at 14 days postoperatively	3.48 [3.02, 3.94]	4.14 [2.97, 5.30]

Discussion

The author made a comprehensive evaluation of the effectiveness of traditional Chinese medicine in the early treatment of patients after knee arthroplasty, and compared the degree of pain relief, joint mobility, knee function score, inflammatory index level and other indicators on the 3rd, 7th and 14th day after operation. The results of meta-analysis showed that the intervention scheme of traditional Chinese medicine combined with conventional western medicine (observation group) had a more significant effect on the early treatment of patients after knee arthroplasty than the single implementation of

conventional western medicine (control group). In current clinical practice, postoperative pain relief relies mainly on oral nonsteroidal anti-inflammatory drugs and opioids [34,35]. However, the clinical use of opioids is often limited due to their susceptibility to a number of adverse effects, such as nausea, vomiting, respiratory depression and the risk of addiction, and in most cases doctors do not choose to use them in the first place, and even when they do use them, the dosage is strictly controlled and minimized. In comparison, NSAIDs have fewer adverse effects, but long-term use of NSAIDs still carries the risk of digestive, cardiovascular and other systemic diseases [36].

However, the combined application of traditional Chinese medicine on the basis of conventional Western medicine therapies, and the appropriate reduction of the dosage of Western medicine can significantly reduce the rate of adverse reactions and more effectively alleviate the pain of patients [37]. According to the theory of traditional Chinese medicine, knee arthroplasty is a traumatic operation. After operation, it is easy to cause obstruction of qi and blood circulation, endogenous blood stasis, resulting in local qi and blood stagnation, which is in line with the theory of Huangdi Neijing pain is caused by obstruction. The poor qi and blood of meridians is the key factor causing pain. Therefore, traditional Chinese medicine applies the method of promoting blood circulation and removing blood stasis. With the drugs that have the effect of promoting temperature, it focuses on dredging the meridians, qi and blood, resolving the pattern of blood stasis block, so as to relieve postoperative pain [38]. From the perspective of the relationship between liver and kidney and knee joint, the basic theory of traditional Chinese medicine upholds the theory of liver and kidney homology, that is, kidney governs bone and liver governs tendon.

This view also has evidence in the Huangdi Neijing, such as “the liver is the root of the extreme, its Hua is in the claw, its filling in the tendon, the kidney is the main sting, the root of the seal, its Hua is in the hair, its filling in the bone, which clearly clarifies that the bone and tendon tissue of the knee joint is closely related to the liver and kidney [38,39]. Postoperative patients often have liver and kidney deficiency due to traumatic stress and qi and blood loss, which greatly affects the normal repair process of knee joint. Rehmannia glutinosa as a nourishing liver and kidney medicine [40], as the Compendium of Materia Medica recorded filling bone marrow, long muscle, producing essence and blood, tonifying the five internal organs, internal injury is insufficient, its taste is sweet and slightly warm, belonging to the liver and kidney meridians, can rely on the function of nourishing liver and kidney, help bone and tendon repair, strengthen the stability of the knee joint, effectively alleviate the pain symptoms derived from liver and kidney deficiency.

At the level of joint mobility and knee function improvement, the combination of traditional Chinese and Western medicine treatment also has a significant effect, which is more prominent than the conventional therapies of Western medicine alone. According to the theory of prime question, yin and yang should be like the big theory and blood should be determined, blood stasis is retained in the body, new blood is difficult to produce, and meridians are blocked, which is bound to cause limited joint activity. Traditional Chinese medicine for promoting blood circulation and removing blood stasis can play the role of smoothing blood vessels and dissipating blood stasis. It follows the principle of “general rule without pain,” resolves swelling, relieves pain, and creates favorable conditions for free joint activity [41]. After Meta-analysis, it was verified that traditional Chinese medicine com-

bined with conventional Western medicine therapies can further reduce the C-reactive protein index of patients after knee arthroplasty.

From the perspective of traditional Chinese medicine, postoperative blood stasis block is the key reason for the persistence of inflammatory response. The internal obstruction of blood stasis leads to the disorder of qi and blood operation, which is easy to cause heat and fire, and aggravates the degree of inflammation [42]. From the analysis of modern medicine, traditional Chinese medicine for promoting blood circulation and removing blood stasis has the effect of improving local blood circulation, reducing blood viscosity and reducing microthrombosis. Taking tanshinone contained in Danshen and ligustrazine contained in Chuanxiong as an example, these components can effectively inhibit platelet aggregation, promote vasodilation, accelerate the absorption of inflammatory exudates, and then reduce local inflammatory response and help patients recover after operation [43].

In the treasure house of traditional Chinese medicine, many classic decoctions have a significant effect on improving multiple indicators of patients after knee arthroplasty. Kunpeng Zhang, et al. [44] found that the application of Xuefu Zhuyu Decoction can effectively reduce the swelling of lower limbs of patients after knee arthroplasty, and has high safety. Taoren, Honghua and Danggui in the prescription can promote blood circulation and remove blood stasis, and Achyranthes bidentata can promote blood circulation and remove blood stasis, so as to relieve pain and reduce limb swelling. Chuanyuan Chen, et al. [45] found that the application of Zhitong Siwu Decoction can relieve the pain of patients after knee arthroplasty and accelerate the recovery of patients' postoperative function. The papaya in the prescription is the monarch, playing the role of soothing the tendons and activating the collaterals, dehumidification and arthralgia. The salvia miltiorrhiza is used to promote blood circulation, reuse the cooked land to nourish blood and yin, benefit the essence and generate marrow, and combine various drugs to improve the rehabilitation effect after knee joint surgery.

Conclusion

In summary, the application of traditional Chinese medicine has a significant effect in the early treatment of patients after knee arthroplasty. It can play a good role in postoperative wound pain, limb swelling, limited activity, infection and so on. It provides a safe and effective rehabilitation approach for patients, enriches the postoperative treatment plan for doctors, and is recommended for clinical application. However, this study has limitations. The differences in the intervention schemes of each study lead to high heterogeneity. Although the results of sensitivity analysis are robust, it is still necessary to standardize the details of traditional Chinese medicine intervention, clarify the compatibility of prescriptions, dosage forms and course of treatment, improve the quality and universality of evidence,

and provide value for clinical practice and further verification of the effectiveness of traditional Chinese medicine in the field of treatment after knee arthroplasty.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2025.62.009784

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