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REVIEW

Efficacy and Safety of Fu's Subcutaneous Needling in the Treatment of Cervical Spondylosis: A Systematic Review and Meta-Analysis Based on Randomized Controlled Trials

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Background: Spondylosis (CS) is a prevalent condition that significantly impacts quality of life and overall health. Fu's subcutaneous needling, a novel acupuncture technique, has been widely used to treat CS. This study employs a meta-analysis to comprehensively evaluate the efficacy of Fu's subcutaneous needling in treating CS.

Methods: We searched PubMed, Web of Science, Embase, Cochrane Library, China National Knowledge Infrastructure (CNKI), China Science Periodical Database (CSPD), Chinese Citation Database (CCD), and Chinese biomedical literature service system (CBM) databases for clinical trials on Fu's subcutaneous needling for CS, from inception to March 1, 2025. The quality of the included studies was assessed using the Cochrane Handbook for Systematic Reviews, and meta-analysis was performed using Stata 16.0.

Results: A total of 46 studies involving 3767 cases were included. The results showed that the Fu's subcutaneous needling group had a higher effective rate than the control group (RR: 1.17, 95% CI: 1.14–1.20, $p < 0.05$). The Fu's subcutaneous needling group also had lower Visual Analog Scale (VAS) scores (WMD: −1.55, 95% CI: −1.98 to −1.12, $p < 0.05$), lower Northwick Park Neck Pain Questionnaire (NPQ) scores (WMD: −2.65, 95% CI: −5.27 to −0.03, $p < 0.05$), and lower Neck Disability Index (NDI) scores (WMD: −3.40, 95% CI: −6.59 to −0.21, $p < 0.05$) compared to the control group. The Fu's subcutaneous needling group also demonstrated higher safety (RR: 0.32, 95% CI: 0.13–0.75, $p < 0.05$). Subgroup analysis indicated that Fu's subcutaneous needling was effective across various subtypes of CS and showed significant advantages over other treatment modalities. The Efficacy of Fu's subcutaneous needling improved with longer treatment durations.

Conclusion: Fu's subcutaneous needling is effective and safe for treating CS. Due to the limited number of included studies, further research is needed to confirm these findings.

Keywords: Fu's subcutaneous needling, spondylosis, efficacy, safety, systematic review, meta-analysis

Introduction

Cervical Cervical spondylosis (CS) refers to a syndrome caused by degenerative changes in the cervical intervertebral discs and subsequent pathological changes affecting surrounding structures (eg, nerve roots, spinal cord, vertebral arteries, sympathetic nerves), leading to a range of clinical symptoms and signs. The primary pathological features include cervical disc herniation, osteophyte formation, narrowing of joint CSces, and foraminal stenosis.[1] Common symptoms include neck and shoulder pain, dizziness, headaches, and arm numbness, with severe cases potentially leading to paralysis.[2]

With the aging population, societal changes, and evolving work patterns, the incidence of CS is increasing and becoming more prevalent among younger individuals. The condition is influenced by poor posture, prolonged work hours, psychological

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stress, repetitive movements, prolonged static loads, and work environment factors.[3,4] In 2017, the global prevalence of neck pain was estimated at 166 million cases in women and 122.7 million cases in men, making it a significant global health issue.[5] Current treatments for CS primarily include non-steroidal anti-inflammatory drugs (NSAIDs), which, while effective, often cause gastrointestinal side effects and, with long-term use, may lead to liver and kidney damage, increased cardiovascular risks, and, in some cases, allergic or neurological reactions.[6] Non-pharmacological treatments, such as acupuncture, exercise, and massage, are also commonly used, with varying clinical outcomes.

Fu's subcutaneous needling is a new type of acupuncture therapy invented by Professor Fu Zhonghua based on traditional acupuncture, mainly used to treat pain.[7] The Fu's subcutaneous needling therapy requires the use of specially designed needles to insert into the loose connective tissue under the skin and perform large-scale sweeping. It can quickly relieve muscle CSsms, promote local circulation, alleviate symptoms, and maintain a long-lasting analgesic effect. Its mechanism of action mainly lies in the repeated pulling of the needle on the subcutaneous connective tissue, which can rapidly relieve muscle CSsms, improve blood supply and nutrition in the affected area, and eliminate local inflammatory reactions. Although the Fu's subcutaneous needling therapy is applied to superficial areas, it can immediately increase the elasticity of abnormally tense and CSstic muscle tissues, relieve tension, and alleviate pain. Doctors can immediately detect the softening of the stiff and cord-like muscles, and patients will experience reduced or eliminated pain, with quick results.[8] Compared with traditional acupuncture, the Fu's subcutaneous needling has the following advantages: (1) The Fu's subcutaneous needling is easy to operate, only inserted into the loose connective tissue under the skin, causing no pain under the skin, with low risk and less pain, making it easier for patients to accept; (2) The Fu's subcutaneous needling is usually treated once every three days, with a lower frequency than traditional acupuncture, making the treatment more relaxed, and establishing good doctor–patient interaction during the treatment process, improving patient compliance; (3) The Fu's subcutaneous needling takes effect quickly and has a long-lasting therapeutic effect, with a wide range of indications. Studies have shown that the Fu's subcutaneous needling is more effective than traditional acupuncture. The Fu's subcutaneous needling has been successfully applied in the treatment of Cervical spondylosis and has obtained many clinical evidences.[9,10] However, there are still controversies about its clinical efficacy. To comprehensively evaluate the efficacy of Fu's subcutaneous needling in the treatment of Spondylosis, this study will use the Meta-analysis method to conduct a systematic review of the research on the treatment of Cervical spondylosis with Fu's subcutaneous needling, providing evidence for the treatment of Cervical spondylosis with Fu's subcutaneous needling.

Methods

Study Registration

This study was registered with PROSPERO (ID: CRD420250655830).

Eligibility Criteria

Inclusion Criteria

Population: Patients diagnosed with CS. Given the variability in diagnostic criteria across studies, any study that met relevant diagnostic standards was included. There were no restrictions on race, nationality, gender, age, or disease duration. CS classification:[11] Cervical Spondylotic Radiculopathy (CSR): It is a degenerative disease mainly caused by lateral protrusion of intervertebral discs, hyperplasia of uncovertebral joints, and stenosis of intervertebral foramina, characterized by radiating pain, numbness in the neck, shoulders, and upper limbs. Cervical Spondylosis of Vertebral Artery Type (CSA): It is a disease mainly caused by various mechanical and dynamic factors that compress or stimulate the vertebral artery, leading to vascular stenosis and distortion, characterized by insufficiency of blood supply to the basilar and vertebral arteries. Cervical Spondylosis (CSL): It is an early type, mainly characterized by neck and shoulder pain and discomfort, limited neck movement, stiffness of the neck muscles, and corresponding tenderness.

Intervention: Fu's subcutaneous needling.

Comparison: Other treatment methods (including Western medicine, acupuncture, electroacupuncture, massage, etc.).

Outcomes: Primary outcomes: Effective rate (number of effective cases/total cases × 100%); Visual Analog Scale (VAS) score:[12] a subjective tool used to assess pain intensity, scored from 0 to 10, with lower scores indicating less pain;

adverse reactions. Secondary outcomes: Northwick Park Neck Pain Questionnaire (NPQ):[13] a 9-item scale assessing neck pain intensity and its impact on sleep, with a total score of 36, where lower scores indicate less pain; Neck Disability Index (NDI):[14] a self-assessment tool for neck disability due to pain, scored from 0 to 50, with lower scores indicating better neck function.

Study Design: Randomized controlled trials (RCTs).

Exclusion Criteria

Duplicate publications; reviews, case reports, basic experiments, etc. Studies where the control group used Fu's subcutaneous needling or the experimental group used Fu's subcutaneous needling combined with other therapies. Studies with incomplete data. Studies that could not be retrieved through any means. Conference abstracts not peer-reviewed. Multiple studies from the same RCT, with the study having the largest sample size, most complete follow-up, and most outcome measures included.

Data Sources and Search Strategy

We searched China National Knowledge Infrastructure (CNKI), China Science Periodical Database (CSPD), Chinese Citation Database (CCD), and Chinese biomedical literature service system (CBM), PubMed, Embase, Cochrane Library, and Web of Science for RCTs on Fu's subcutaneous needling for CS, up to March 1, 2025. A combination of subject headings and free-text terms was used. The search strategy is detailed in the supplementary material 1.

Study Selection

Two researchers independently screened the literature based on the search strategy. The retrieved studies were imported into EndNote X9, and duplicates were removed. The remaining studies were further screened by reading titles and abstracts, and full texts were reviewed for final inclusion. Disagreements were resolved through discussion with a third researcher.

Data Extraction

Two researchers independently extracted data using a pre-designed form. The extracted information included: Basic information: Title, author, year, study type, diagnostic criteria, intervention, treatment duration, outcome measures. Demographic characteristics: Sample size, age, gender. Methodological information: Randomization method, allocation concealment, blinding, etc. Discrepancies were resolved through discussion.

Risk of Bias Assessment

Two researchers assessed the risk of bias using the Cochrane Risk of Bias Tool for RCTs.[15] The tool evaluates seven domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other biases. Each domain was rated as low, high, or unclear risk of bias.

Statistical Analysis

Statistical analysis was performed using Stata 16.0. Heterogeneity was assessed using the Q statistic and I^2 test. A fixed-effects model was used if $P \geq 0.1$ or $I^2 \leq 50\%$; otherwise, a random-effects model was applied. Subgroup analysis and meta-regression were used to explore sources of heterogeneity. Relative risk (RR) and 95% confidence intervals (CI) were used for dichotomous data, while weighted mean difference (WMD) and 95% CI were used for continuous data. A significance level of $\alpha = 0.05$ was set. Publication bias was assessed using funnel plots and Egger's regression for outcomes with ≥10 studies. Sensitivity analysis was conducted to evaluate the stability of the results.

GRADE Evidence Quality Assessment

Two researchers independently assessed the quality of evidence for each outcome using the GRADE system.[16] The evidence was rated as high, moderate, low, or very low based on study limitations, inconsistency, indirectness, imprecision, and publication bias. RCTs were initially rated as high quality and downgraded based on the assessment criteria.

Results

Study Selection

A total of 603 relevant studies were initially retrieved. After removing 148 duplicates and excluding 394 studies based on other reasons,[14] studies were excluded after full-text review (3 due to incomplete data,[11] due to inappropriate interventions, and[1] due to lack of relevant outcomes). Finally,[17] studies were included. Figure 1 is the study selection flowchart.

Study Characteristics

The[17] included[17–63] studies involved 3767 patients (1893 in the experimental group and 1874 in the control group). The studies were conducted in China and published between 2009 and 2024. The experimental group received Fu's subcutaneous needling, while the control group received other treatments, including acupuncture, electroacupuncture, Western medicine, Chinese medicine, and massage. Fu's Subcutaneous Needling Introduction in the supplementary material 2 and Table 1 summarizes the basic characteristics of the included studies.

Risk of Bias Instudies

In terms of random sequence generation (selection bias 1),[25] studies used low-risk methods, while[4] used incorrect methods. For allocation concealment (selection bias 2),[1] study used a low-risk method. Regarding blinding (performance bias and detection bias),[1] study used double-blinding. Due to the nature of Fu's subcutaneous needling, blinding was difficult to implement, but this had minimal impact on the results. All studies had complete data, with no evidence of selective reporting or other sources of publication bias. The overall quality of the studies was moderate, with[2] studies rated as "low risk" (4%),[4] as "high risk" (8%), and 41 as "moderate risk" (88%). Figure 2 is the results of the Risk of Bias assessment.

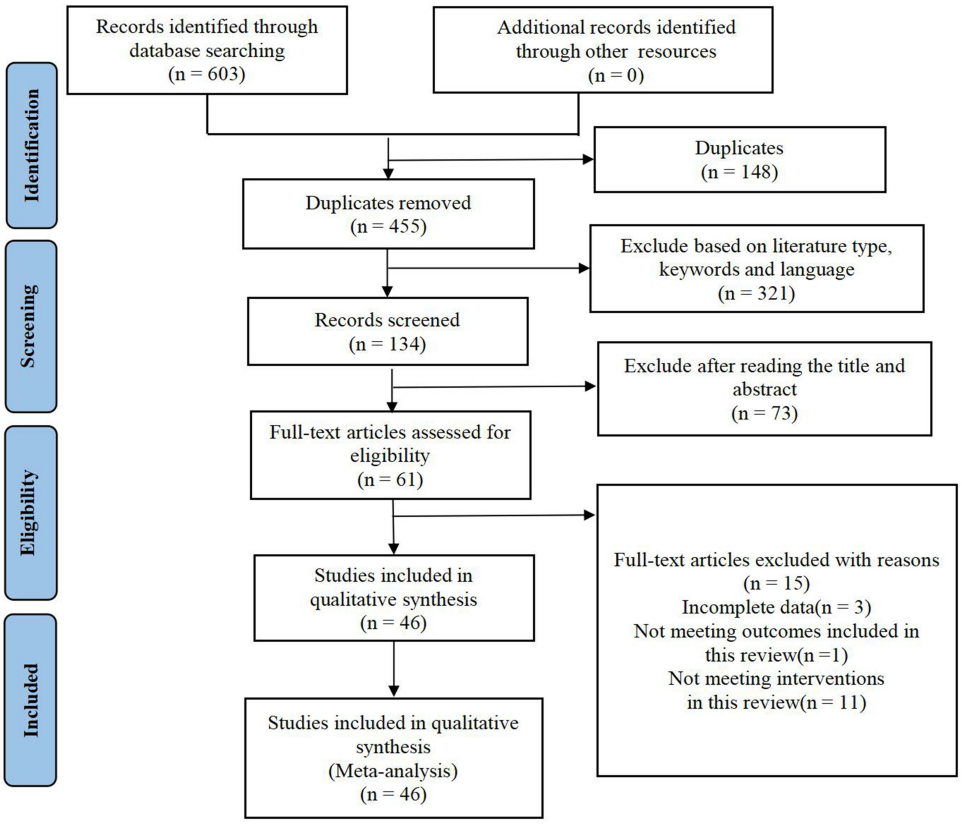

Figure 1 The study selection flowchart.

Table 1 The Basic Characteristics of the Included Studies

Author	Year	Disease subtype	Intervention	Sample size	Age	Time	Outcomes
Li GW[18]	2009	CSA	IVS3	60,60	55.85±6.6,54.26±5.38	21d	①
Wan XC[19]	2009	NA	IVS2	32,27	51.3,51.7	10d	①
Ji YL[20]	2011	CSR	IVS2	31,26	45.34±13.25,42.97±15.69	10d	①
Huang SZ[21]	2014	NA	IVS2	49,46	40.2±6.8,40.4±5.5	10d	①
Xie XH[22]	2015	CSR	IVS2	30,30	49.8±2.7,47.6±3.1	14d	①,②,④
Zhang Y[23]	2016	CSL	IVS4	48,48	20~60,19~58	14d	①,②
Wang YJ[24]	2017	CSA	IVS6	80,80	38.12±4.20,39.20±4.81	7d	①
Chang M[25]	2018	CSR	IVS4	25,25	NA	7d	①,②
Kang MR[26]	2018	CSR	IVS3	41,40	53.64±3.4,54.50±4.60	7d	①,②
Li WS[27]	2018	CSR	IVS3	100,100	51,54		①
Su XF[28]	2018	CSA	IVS2	25,25	33~65	10d	①
Chen W[29]	2019	CSL	IVS2	30,30	46±12.6,45±10.3		②,④
Wang H[30]	2019	CSL	IVS5	32,32	48.2±4.5,50.7±3.8	7d	①,②
Chen QL[31]	2020	CSR	IVS7	30,30	40±4.5,39±5.6	9d	①,②
Hu Y[32]	2020	CSR	IVS3	30,30	48.83±6.92,48.21±7.13	14d	①,②,⑤
Li MJ[33]	2020	CSA	IVS2	100,100	49.53±9.61,50.25±9.46	14d	①
Li YX[34]	2020	CSA	IVS2	30,30	42.56±7.39,38.53±9.50	14d	①,②
Peng GR[35]	2020	CSL	IVS2	30,30	NA	10d	①
Sun ZY[36]	2020	CSL	IVS4	40,40	51.20±4.22,51.76±4.42	14d	①,②
Yuan SM[37]	2020	NA	IVS2	15,15	43.23±3.53,43.64±3.12	10d	①,⑤
Zhong X[38]	2020	CSL	IVS2	40,40	37.12±1.64,36.45±1.45	21d	①,②
Zhou YH[39]	2020	CSA	IVS4	60,60	40±6.25,38±6.89	14d	①,⑤
Bai YF[40]	2021	CSR	IVS3	33,32	50.27±5.14,50.93±5.65	14d	①,②,⑤
Chen J[41]	2021	CSR	IVS5	30,30	45.87±7.03,46.78±6.74	21d	①,②
Lin YH[42]	2021	CSR	IVS3	89,89	45,46	10d	①
Luo ZP[43]	2021	NA	IVS2	40,40	42.74±3.23,44±2.52	NA	①
Mo XX[44]	2021	NA	IVS5	30,30	45.68±3.35,46.56±3.11		①,②
Wang B[45]	2021	CSR	IVS3	30,30	45.43±11.63,48.23±2.52	7d	①,③
Xu S[46]	2021	NA	IVS2	40,40	45.16±1.69,46.10±1.86	14d	②
Zhu X[47]	2021	CSL	IVS5	45,45	36.12±8.49,35.68±7.91	14d	①,②,④
Huang CH[48]	2022	NA	IVS2	30,30	52.73±9.81,52.16±16.10	14d	②,④
Cao L[49]	2022	CSR	IVS4	63,63	54.79±6.48,55.12±6.38	28d	①,②
Han SY[50]	2022	CSL	IVS3	30,30	NA	14d	②,④
Peng JP[51]	2022	CSL	IVS3	30,30	44.20±11.38,42.30±9.61	14d	②
Yang XF[52]	2022	CSA	IVS3	41,41	41.26±6.71,40.92±5.65	21d	①,②,③,⑤
Cai L[53]	2023	CSR	IVS2	25,25	50.27±3.46,50.35±4.17	21d	①,②
Li YF[54]	2023	CSR	IVS4	35,35	48.57±3.47,49.02±3.41	14d	①
Li YF2[55]	2023	CSR	IVS4	41,41	49.35±9.23,48.84±10.15	14d	①,②
Lu J[56]	2023	CSL	IVS6	40,40	30.5±8.8,31.3±9.3)	56d	①,②,④
Ma FJ[57]	2023	NA	IVS4	21,20	49.90,50.05	14d	①,③
Ren Y[58]	2023	CSA	IVS4	62,62	41±5,39±5	28d	①
Wang Y[59]	2023	CSR	IVS3	30,30	48.69±5.16,48.48±5.14	14d	①,②,③,⑤
Wu JM[60]	2023	CSA	IVS4	41,37	44.64±4.92,44.18±4.35		①
Li YW[61]	2024	CSA	IVS4	45,45	56.81±6.38,55.90±6.68	21d	①
Tian YL[62]	2024	CSA	IVS8	34,34	50.25±6.03,50.12±5.94	10d	①,③,④
Xie LL[63]	2024	NA	IVS2	30,31	59±11,59±12	28d	②,③

Notes: ① Effective rate; ② VAS; ③ NPQ; ④ NDI; ⑤ Adverse reactions; 1 Fu's subcutaneous needling; 2 Acupuncture; 3 Electroacupuncture; 4 Massage; 5 Traditional Chinese medicine; 6 Western medicine; 7 Moxibustion; 8 Hyperbaric oxygen.
Abbreviation: NA, not applicable.

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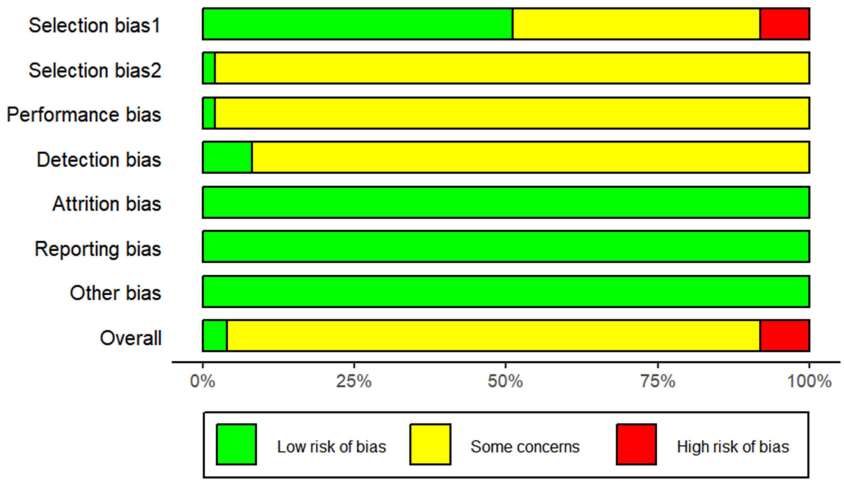

Figure 2 The results of the Risk of Bias assessment.

Meta Analysis

Effective Rate

Forty studies reported effective rates. Heterogeneity was low (I^2 =23.3%), so a fixed-effects model was used. The results showed that Fu's subcutaneous needling had a significant advantage over the control group (RR: 1.17, 95% CI: 1.14–1.20, $p < 0.05$). Figure 3 is the forest plot for efficacy.

VAS

Twenty-six studies reported VAS scores. Heterogeneity was high ($I^2 = 98.7\%$), so a random-effects model was used. Fu's subcutaneous needling significantly reduced VAS scores compared to the control group (WMD: −1.55, 95% CI: −1.98 to −1.12, $p < 0.05$). Figure 4 is the forest plot for VAS.

NPQ

Six studies reported NPQ scores. Heterogeneity was high ($I^2 = 97.6\%$), so a random-effects model was used. Fu's subcutaneous needling significantly reduced NPQ scores compared to the control group (WMD: −2.65, 95% CI: −5.27 to −0.03, $p < 0.05$). Figure 5 is the forest plot for NPQ.

NDI

Seven studies reported NDI scores. Heterogeneity was high ($I^2 = 97.3\%$), so a random-effects model was used. Fu's subcutaneous needling significantly reduced NDI scores compared to the control group (WMD: −3.40, 95% CI: −6.59 to −0.21, $p < 0.05$). Figure 6 is the forest plot for NDI.

Adverse Reactions

Six studies reported adverse reactions. Heterogeneity needling had a significantly lower rate of was low ($I^2 = 0\%$), so a fixed-effects model was used. Fu's subcutaneous adverse reactions compared to the control group (RR: 0.32, 95% CI: 0.13–0.75, $p < 0.05$). Figure 7 is the forest plot for adverse reactions. Table 2 is the adverse reactions.

Subgroup and Sensitivity Analysis

Subgroup analysis was performed for Effective rate and VAS. The results showed that Fu's subcutaneous needling was effective across different subtypes of CS and had significant advantages over other treatments. Sensitivity analysis confirmed the stability of the meta-analysis results. Table 3 is the subgroup analysis results.

Table 4 is the sensitivity analysis results.

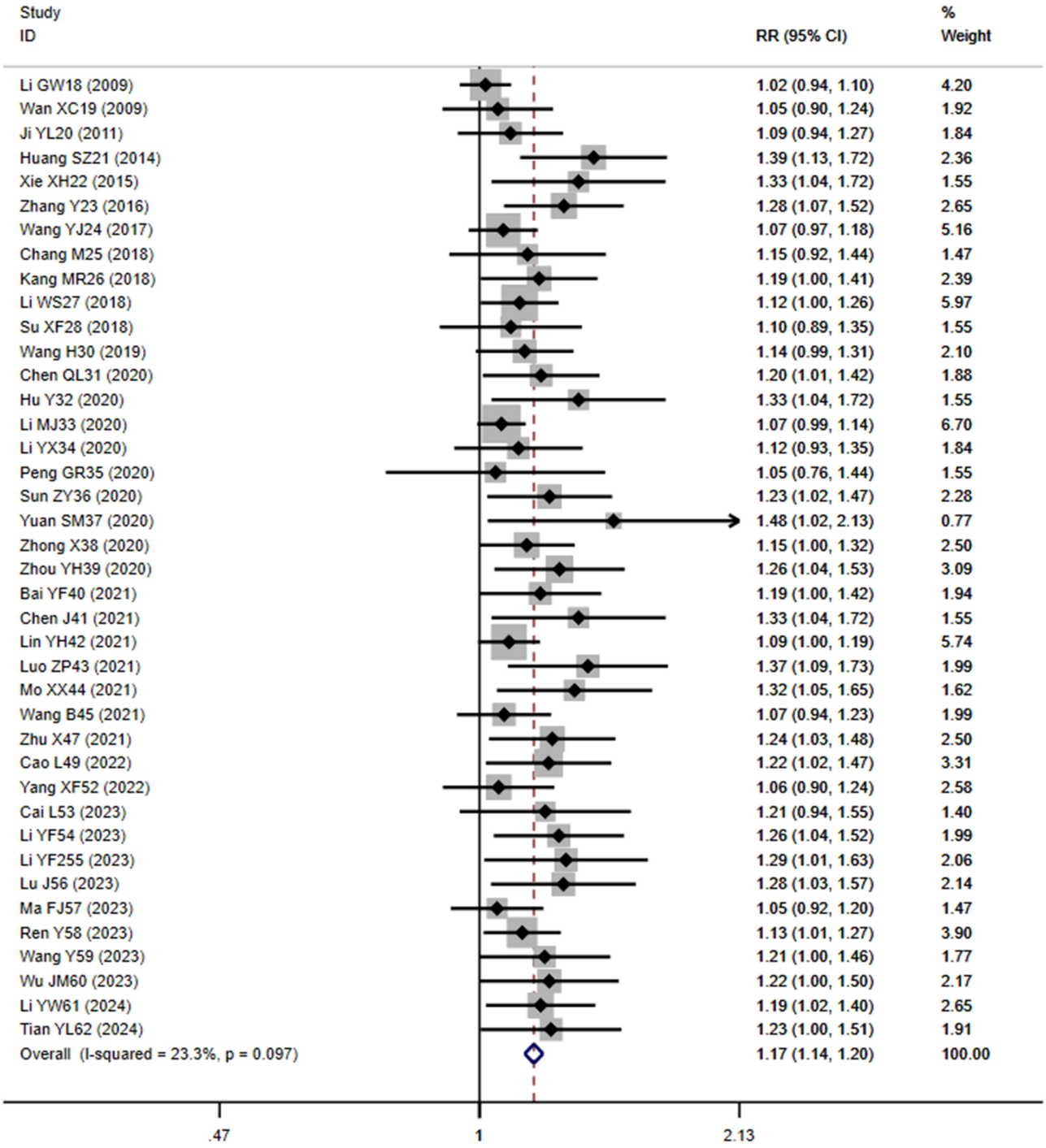

Figure 3 The forest plot for efficacy.

Meta-Regression

Meta-regression was performed for outcomes with high heterogeneity. The results showed that disease subtype, intervention, and treatment duration had no significant impact on the results ($P > 0.05$). Table 5 is the meta-regression results.

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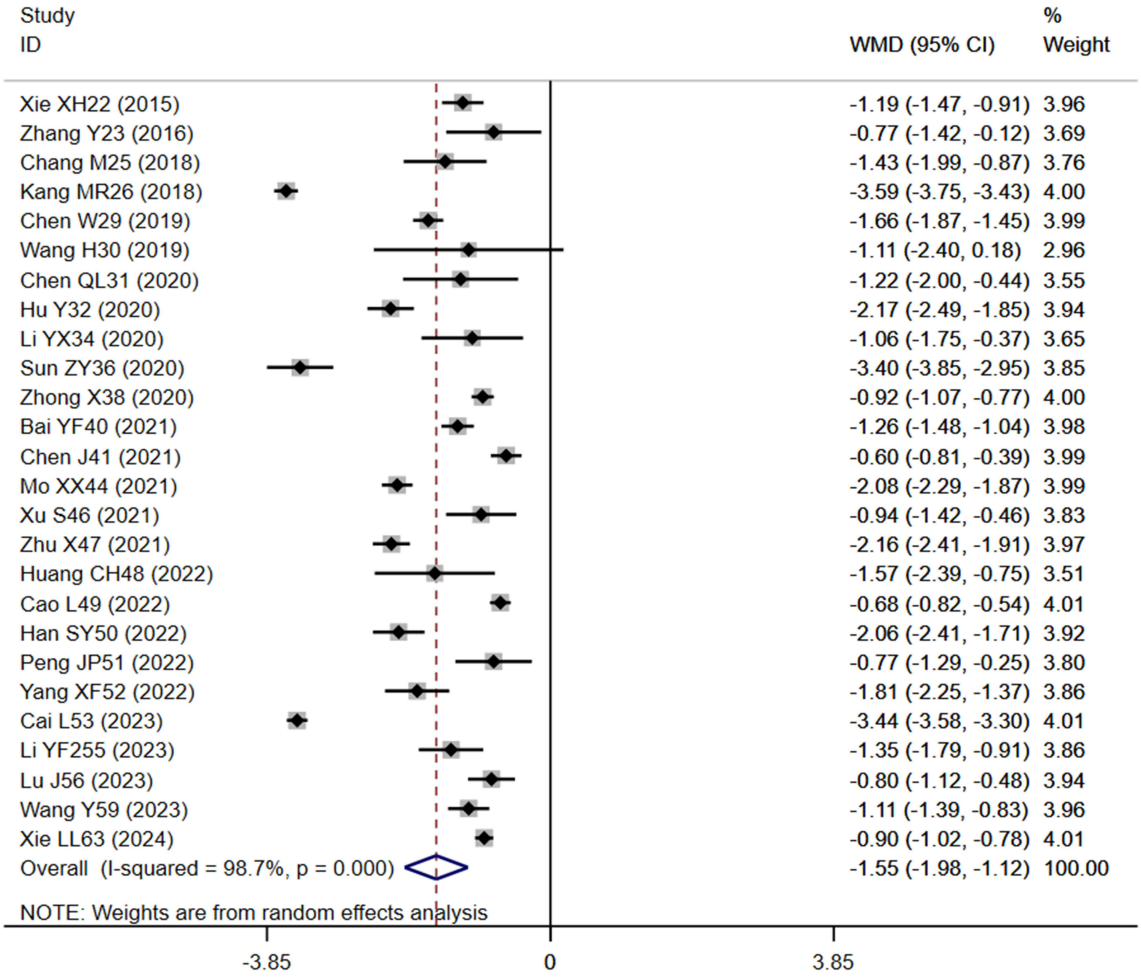

Figure 4 The forest plot for VAS.

Publication Bias

Publication bias was assessed for Effective rate and VAS. For Effective rate, Egger's test indicated potential publication bias ($P < 0.05$), and the trim-and-fill method suggested that the RR value slightly decreased after adjustment. For VAS, Egger's test showed no significant publication bias ($P > 0.05$). Figure 8A and B is the funnel plots. Table 6 is the Egger and trim-and-fill results.

GRADE Evidence Quality Assessment

The GRADE assessment showed that the evidence quality was high for Effective rate but low for VAS, NPQ, and NDI, primarily due to high heterogeneity.

Table 7 is the GRADE evidence quality assessment results.

Discussion

This study included 46 RCTs involving 3767 patients. The results showed that Fu's subcutaneous needling had significant advantages over the control group in terms of efficacy (effective rate, VAS, NPQ, NDI) and safety (adverse reactions). However, some outcomes had high heterogeneity. Subgroup analysis indicated that Fu's subcutaneous needling was effective across different subtypes of CS and had significant advantages over other treatments. The efficacy of Fu's subcutaneous needling improved with longer treatment durations. However, due to the limited number of studies in some subgroups, further research is needed to confirm these findings. Sensitivity analysis confirmed the stability of the meta-

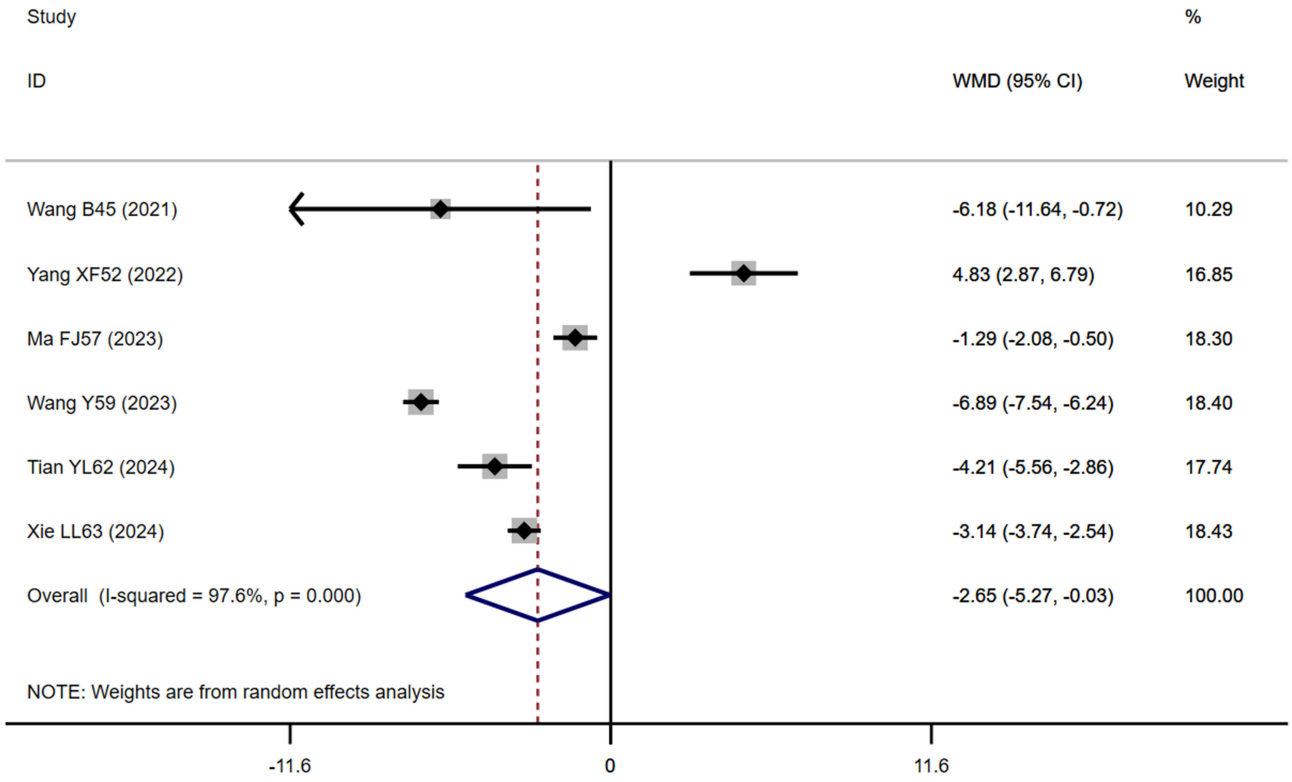

Figure 5 The forest plot for NPQ.

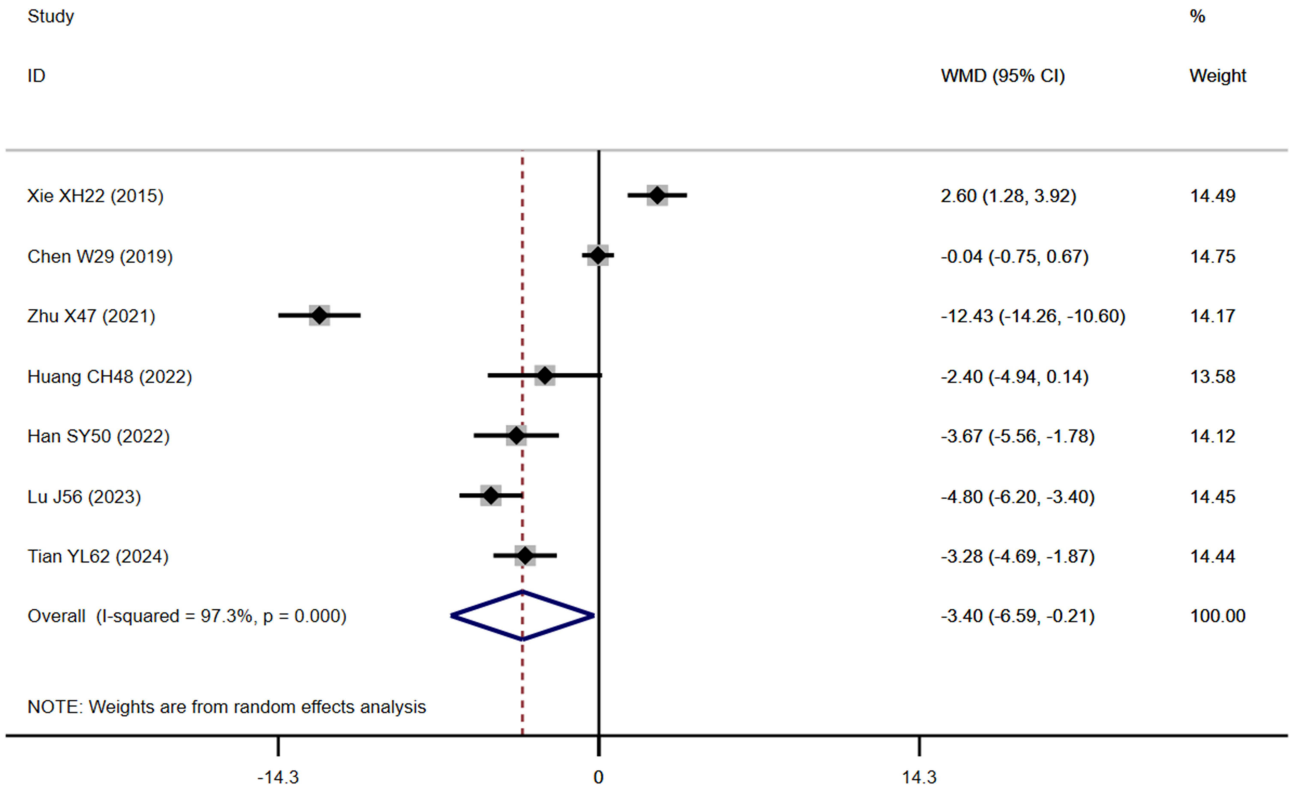

Figure 6 The forest plot for NDI.

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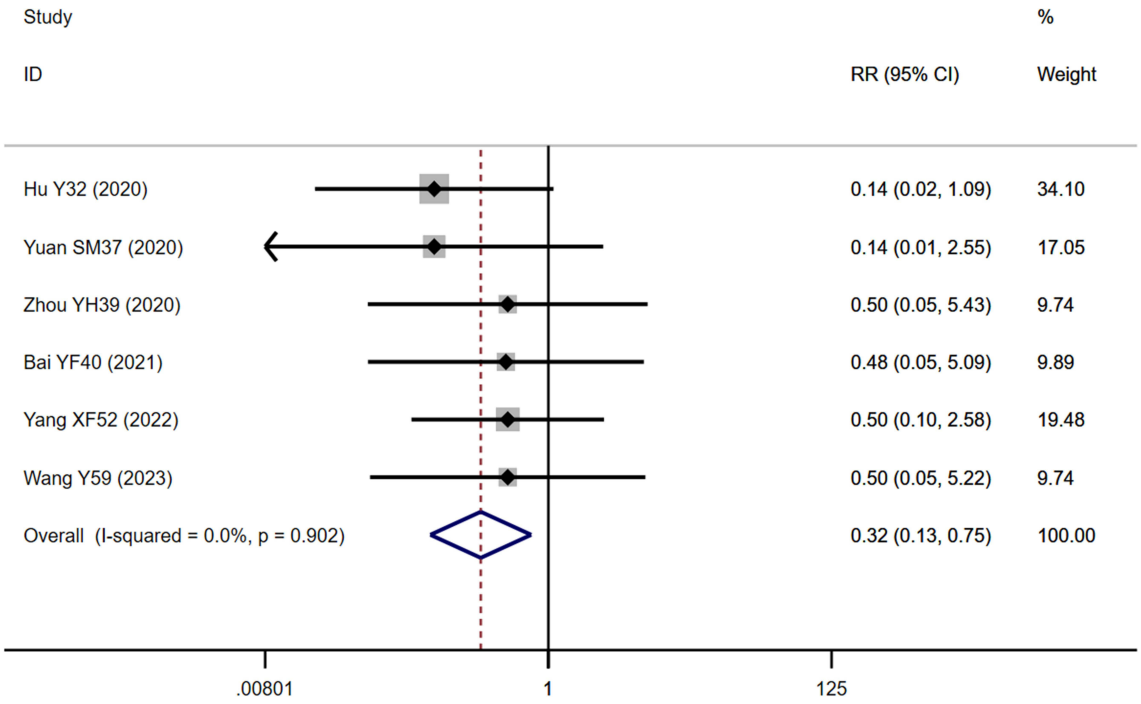

Figure 7 The forest plot for adverse reactions.

analysis results. Spondylosis is a common degenerative joint disease, and its incidence is increasing due to modern lifestyle changes, significantly impacting patients' quality of life. Traditional treatments, including medication, physical therapy, and surgery, have limitations such as side effects and limited efficacy. Fu's subcutaneous needling, a novel acupuncture technique, has shown unique advantages in treating CS. The GRADE evidence quality assessment indicated moderate evidence quality.

Fu's subcutaneous needling, developed by Professor Fu Zhonghua, is based on traditional acupuncture and modern medical theories.[64] It targets ischemic and hypoxic muscles by identifying myofascial trigger points (MTrPs) and involves sweeping movements in the subcutaneous loose connective tissue. This technique generates mechanical forces that alter the spatial structure of the connective tissue, producing bioelectric effects that improve local blood circulation, reduce inflammation, and alleviate pain.[65,66] The unique aspect of Fu's subcutaneous needling is its "reperfusion activity", which involves rhythmic movements of the affected muscles during treatment to enhance blood flow and relieve ischemia. The most significant difference between Fu's subcutaneous needling and traditional acupuncture lies in the reperfusion activity. This activity was created by Dr. Fu Zhonghua and refers to the doctor using the other hand or

Table 2 Adverse Reactions

Study	Intervention Group	Control Group
Hu Y[32]	Fainting due to acupuncture (1 case)	Fainting due to acupuncture (2 case), sticking of needle (in acupuncture) (2 case), The needle is bent (1 case), infection (1 case), ache (1 case)
Zhou YH[39]	Unclear (1 case)	Unclear (2 case)
Yuan SM[37]	0	Pruritus (1 case), rubedo (2 case)
Bai YF[40]	Ache (1 case)	Ache (1 case), fainting due to acupuncture (1 case)
Yang XF[52]	Hematoma (1 case), fainting due to acupuncture (1 case)	Hematoma (2 case), fainting due to acupuncture (1 case), Pallor (1 case)
Wang Y[59]	Nausea (1 case)	Ache (1 case), nausea (1 case)

Table 3 Subgroup Analysis Results

Outcomes	SUBGROUP	Effective Rate			VAS		
		Trials	I^2	RR (95% CI)	Trials	I^2	MD(95% CI)
Disease subtype	CSA	12	31.80%	1.15(1.11,1.20)	2	69.10%	−1.48(−2.21,−0.76)
	CSR	16	0	1.18(1.13,1.24)	11	99.30%	99.3–1.64(−2.47,−0.82)
	CSL	7	0	1.18(1.15,1.21)	9	95.80%	−1.54(−2.06,−1.03)
Intervention	IVS2	13	35.10%	1.20(1.13,1.27)	8	99.20%	−1.47(−2.31,−0.62)
	IVS3	9	25.80%	1.12(1.07,1.17)	7	98.60%	−1.83(−2.74,−0.92)
	IVS4	11	0	1.20(1.14,1.27)	5	97.00%	−1.53(−2.54,−0.52)
	IVS5	4	0	1.25(1.15,1.37)	4	97.60%	−1.52(−2.44,−0.61)
Time	7d	5	0	1.11(1.04,1.19)	3	96.90%	−2.10(−3.89,−0.31)
	10d	9	14.80%	1.15(1.08,1.22)	NA	NA	NA
	14d	13	31.20%	1.20(1.15,1.25)	11	92.90%	−1.64(−2.05,−1.22)
	21d	7	51.60%	1.20(1.12,1.29)	4	99.60%	−1.69(−3.23,−0.15)

Table 4 Sensitivity Analysis Results

Outcomes	Meta Analysis	Sensitivity Analysis
Effective rate	1.18(1.15,1.21)	1.17(1.14,1.21)
VAS	−1.55(−1.98,-1.12)	−1.55(−1.97,-1.12)
NPQ	−2.65(−5.27,-0.03)	−2.65(−5.27,-0.03)
NDI	−3.40(−6.59,-0.21)	−3.40(−6.59,-0.21)
Adverse reaction	0.35(0.14,0.87)	0.35(0.14,0.87)

Table 5 Meta-Regression Results

Outcomes	Influencing Factors		
	Disease Subtype	Intervention	Time
VAS	0.65	0.53	0.57
NPQ	0.95	0.70	0.55
NDI	0.58	0.62	0.70

other parts of the body to prompt the patient to rhythmically and vigorously move the muscles near the needle insertion point within a short period of time during the sweeping process, or the patient consciously and repeatedly moves the muscles related to the illness. Repeatedly moving the muscles near the needle insertion point can restore blood flow to ischemic areas, and also make the blood flow in a wavelike manner, enhancing the power of blood flow and expanding its range, thereby improving the ischemic state of local tissues and relieving spasm and swelling, reducing pain and improving therapeutic effects.[67] The muscles in the neck and shoulder area are often in a tense state for a long time, leading to high local metabolism, blocked tissue fluid and blood circulation, accumulation of pain-causing substances, and stimulation of pain receptors to cause pain, further causing muscle tension and forming a vicious cycle.[68] The subcutaneous loose fascia where the Fu's subcutaneous needling acts are rich in tissue fluid. The directional sweeping of the Fu's subcutaneous needling can play a role in unblocking meridians and quickly draining, quickly removing pain-causing substances.[69] Combined with muscle resistance, it can allow tissue fluid to quickly enter deep and shallow tissues, restoring tissue elasticity.[70] In addition, the pulling and relaxation of the subcutaneous loose connective tissue by the Fu's subcutaneous needling can cause piezoelectric effects in its liquid crystal structure, conducting bioelectricity to the effector, and then due to the reverse piezoelectric effect, the ion channels of the muscle fibers in the lesion change, and the pathological state of muscle fiber ischemia and hypoxia is improved.[71]

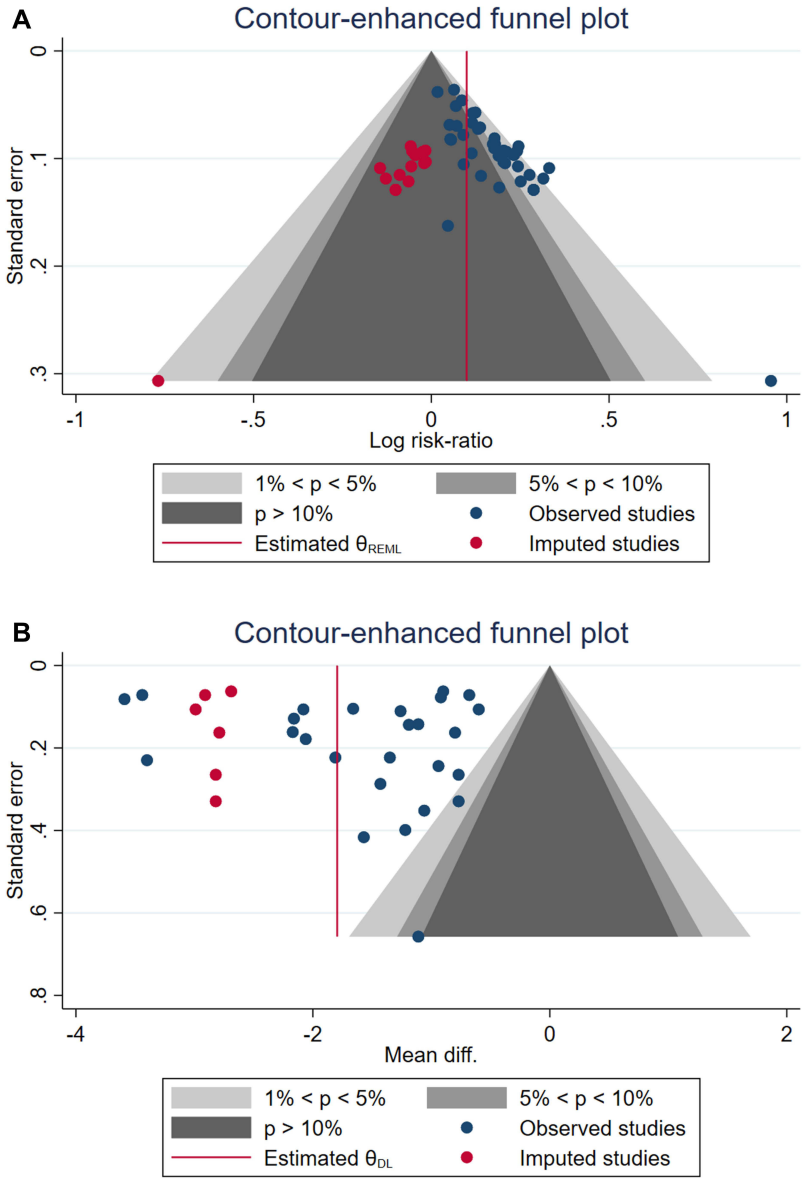

Figure 8 (**A**) The funnel plots for Effective rate. (**B**) The funnel plots for VAS.

Fu's subcutaneous needling therapy has been shown to be effective for a variety of musculoskeletal disorders, including tennis elbow, various types of tenosynovitis, bursitis, chronic knee arthritis, and Achilles tendinitis. Extensive research has demonstrated its clinical efficacy. For example, Zhang Yonghong et al[72] utilized ultrasound elastography to evaluate the effects of Fu's subcutaneous needling therapy on muscle thickness and elasticity in patients with shoulder periarthritis. The findings revealed that Fu's subcutaneous needling therapy outperformed resistance intervention in reducing muscle tension

Table 6 The Results of Egger's Method and the Patching Method

Outcomes	Egger	Trim and Fill Method Outcome	Log RR/MD(95% CI)
Effective rate	0.0001	Observed	0.10(0.08,1.12)
		Observed + Imputed	0.08(0.06,0.10)
VAS	0.44	Observed	−1.55(−1.98–1.12)
		Observed + Imputed	−1.79(−2.17,-1.41)

Table 7 GRADE Evidence Quality Evaluation Results

Outcome	Subgroup	No of studies	Risk of bias	Inconsistency	indirectness	Imprecision	Publication bias	RR/WMD(95% CI)	Quality
Effective rate		41	No	No	No	No	No	1.18(1.15,1.21)	High
	CSA	13	No	−1a	No	No	No	1.15(1.11,1.20)	Moderate
	CSR	16	No	No	No	No	No	1.18(1.13,1.24)	High
	CSL	7	No	No	No	No	No	1.18(1.15,1.21)	High
	IVS2	13	No	−1a	No	No	No	1.20(1.13,1.27)	Moderate
	IVS3	9	No	No	No	No	No	1.12(1.07,1.17)	High
	IVS4	11	No	No	No	No	No	1.20(1.14,1.27)	High
	IVS5	5	No	No	No	No	No	1.25(1.15,1.37)	High
	7d	5	No	No	No	No	No	1.11(1.04,1.19)	High
	10d	9	No	No	No	No	No	1.15(1.08,1.22)	High
	14d	14	No	No	No	No	No	1.20(1.15,1.25)	High
	21d	7	No	−2a	No	No	No	1.20(1.12,1.29)	Low
VAS		26	No	−2a	No	No	No	−1.55(−1.98,-1.12)	Low
	CSR	11	No	−2a	No	No	No	−1.64(−2.47,-0.82)	Low
	CSL	9	No	−2a	No	No	No	−1.54(−2.06,-1.03)	Low
	IVS2	8	No	−2a	No	No	No	−1.47(−2.31,-0.62)	Low
	IVS3	7	No	−2a	No	No	No	−1.83(−2.74,-0.92)	Low
	IVS4	5	No	−2a	No	No	No	−1.53(−2.54,-0.52)	Low
	IVS5	4	No	−2a	No	−1b	No	−1.52(−2.44,-0.61)	Very low
	7d	3	No	−2a	No	−1b	No	−2.10(−3.89,-0.31)	Very low
	14d	11	No	−2a	No	No	No	−1.64(−2.05,-1.22)	Low
	21d	4	No	−2a	No	No	No	−1.69(−3.23,-0.15)	Low
NPQ		6	No	−2a	No	No	No	−2.65(−5.27,-0.03)	Low
NDI		6	No	−2a	No	No	No	−3.40(−6.59,-0.21)	Low
Adverse reactions		5	No	No	No	No	No	0.32(0.13,0.75)	High

Notes: a: If I^2 is between 50% and 75%, the grade will be reduced by one level; if I^2 is greater than or equal to 75%, the grade will be reduced by two levels. b: If the total sample size is less than 300 cases, the grade will be reduced by one level.
Abbreviations: VAS, Visual Analog Scale score; NPQ, Northwick Park Neck Pain Questionnaire; NDI, Neck Disability Index.

and pain while enhancing muscle elasticity (Elasticity value: 2.24 ± 0.58 vs 2.31 ± 0.42; VAS: 3.13 ± 0.76 vs 2.57 ± 0.87). Additionally, Qin et al[73] conducted a randomized trial dividing patients with shoulder periarthritis into a treatment group (Fu's subcutaneous needling) and a control group (acupuncture) to assess the synergistic effects of Fu's subcutaneous needling therapy. Post-treatment results indicated that the treatment group exhibited significantly lower VAS scores compared to the control group ($P < 0.05$), as well as higher Constant-Murley shoulder joint function scores ($P < 0.05$). One month after treatment, statistically significant differences were observed between the two groups in terms of VAS scores and Constant-Murley shoulder joint function scores ($P < 0.05$), suggesting that Fu's subcutaneous needling therapy not only enhances short-term outcomes but also demonstrates notable long-term efficacy. Regarding safety, adverse reactions associated with Fu's subcutaneous needling therapy are relatively rare and typically mild, such as minor subcutaneous bleeding or localized pain. Individuals with needle phobia may occasionally experience transient symptoms like dizziness or nausea, which generally resolve spontaneously without specific intervention. Furthermore, a review of registered clinical trials at the International Clinical Trial Registry Platform (https://clinicaltrials.gov/) and the Chinese Clinical Trial Registry (https://www.chictr.org.cn/) revealed multiple ongoing studies investigating the application of Fu's subcutaneous needling therapy for musculoskeletal conditions (eg, NCT06328153, NCT05085236, NCT03605576, ChiCTR2400087270, ChiCTR2500096533, ChiCTR2400086561). These findings underscore the high research interest in Fu's subcutaneous needling therapy and highlight its considerable potential for further exploration.

This study was conducted and reported in strict adherence to the PRISMA guidelines, ensuring high reliability of the results. Nevertheless, several limitations should be acknowledged. First, studies published in languages other than Chinese and English were excluded, which may have led to potential omissions of relevant research. Second, due to the unique nature of acupuncture therapy, the methodological quality of most included studies exhibited certain

deficiencies. Additionally, variations in patient characteristics and treatment durations across the included studies contributed to substantial heterogeneity in the findings. To address this issue, we applied multiple analytical strategies, and the results demonstrated statistical significance.

Conclusion

This study provides a comprehensive systematic review of the evidence on Fu's subcutaneous needling for CS, considering the effects of intervention, disease subtype, and treatment duration on efficacy and safety. We used strict inclusion and exclusion criteria, including only full-text RCTs. The results confirm the clinical efficacy and safety of Fu's subcutaneous needling for CS, providing valuable guidance for clinical practice. However, this study has some limitations, including potential publication bias and the generally low quality of the included studies. Future research should include larger, high-quality RCTs to provide stronger evidence for the efficacy of Fu's subcutaneous needling in treating CS.

Consent to Participate Declaration

Every human participant provided consent.

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Disclosure

The authors declare that they have no conflicts of interest in this work.

References

1. Venosa M, Romanini E, Padua R, Cerciello S. Comparison of high-intensity laser therapy and combination of ultrasound treatment and transcutaneous nerve stimulation in patients with cervical spondylosis: a randomized controlled trial. *Lasers Med Sci*. 2019;34(5):947–953.
2. Carette S, Fehlings MG. Clinical practice. *Cervical Radiculopathy N Engl J Med*. 2005;353(4):392–399. doi:10.1056/NEJMcp043887
3. Hoy D, March L, Woolf A, et al. The global burden of neck pain: estimates from the global burden of disease 2010 study. *Ann Rheum Dis*. 2014;73(7):1309–1315. doi:10.1136/annrheumdis-2013-204431
4. Dong L, Quindlen JC, Lipschutz DE, Winkelstein BA. Whiplash-like facet joint loading initiates glutamatergic responses in the DRG and spinal cord associated with behavioral hypersensitivity. *Brain Res*. 2012;1461:51–63. doi:10.1016/j.brainres.2012.04.026
5. Arai YC, Ushida T, Osuga T, et al. The effect of acupressure at the extra 1 point on subjective and autonomic responses to needle insertion. *Anesth Analg*. 2008;107(2):661–664. doi:10.1213/ane.0b013e31817b8495
6. Dong YQ. Rational use and adverse reactions of non-steroidal anti-inflammatory drugs. *Medical Food Therapy Health*. 2020;18(22):106–108.
7. Liu JM. Clinical observation of spondylosis with Fu's subcutaneous needling. *Chin J Moxibust*. 2005;21(8):31–32.
8. Zhang YH, Wu T, Shen W, et al. Thickness and elasticity of neck and shoulder pain muscle using ultrasound elastic imaging. *Chin J Acupunct Moxibust*. 2020;40(09):939–941.
9. Chen CF, Cao L, Liu MP, et al. Meta-analysis of the clinical effective rate of Fu's subcutaneous needling in the treatment of peripheral facial paralysis. *J Trad Chin Med Pharm*. 2022;28(11):174–178+192.
10. Wang RA, Jiang XY. Meta-analysis of the effective rate comparison between Fu's subcutaneous needling and traditional acupuncture in the treatment of periarthritis of the shoulder. *J Tradl Chin Med Clin Prac*. 2022;34(02):305–309.
11. Cui XJ, Yao M. Expert consensus on the integrated traditional Chinese and Western medicine diagnosis and treatment of cervical spondylosis *World J Traditional Chin Med*. 2023;18(07):918–922.
12. Faiz KW. VAS–visuell analog skala [VAS--visual analog scale]. *Tidsskr nor Laegeforen*. 2014;134(3):323. doi:10.4045/tidsskr.13.1145
13. Wei HX, Tian Y, Wang XW, et al. Research progress of spondylosis associated evaluation scales. *Chin J Orthopaedic Surg*. 2021;29(11):995–999.
14. MacDermid JC, Walton DM, Avery S, et al. Measurement properties of the neck disability index: a systematic review. J. *Orthop Sports Phys Ther*. 2009;39(5):400–417. doi:10.2519/jospt.2009.2930
15. Higgins JP, Altman DG, Gøtzsche PC, et al. The COCHRANE COllaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011;343(oct18 2):d5928. doi:10.1136/bmj.d5928
16. Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. J. *Clin Epidemiol*. 2011;64(4):383–394. doi:10.1016/j.jclinepi.2010.04.026

17. Xu S. Clinical study of Fu's subcutaneous needling therapy combined with cervical spine operation in the treatment of Spondylosis. *Massage Rehab Med*. 2019;12(12):21–23.
18. Li GW, Zhang C. Effect of Fu's subcutaneous needling therapy in the treatment of Spondylosis with vertebral artery type. *Western Med*. 2009;21 (09):1562–1563.
19. Wan XC. Curative effect of Fu's subcutaneous needling in the treatment of spondylosis in neck, shoulder and back. *J Guiyang College Trad Chin Med*. 2009;31(6):65–66.
20. Ji YL, Fang J, Zhang S. Observation and nursing of 31 cases of nerve root spondylosis treated with Fu's subcutaneous needling. *J Qilu Nurs*. 2011;17(36):34–35.
21. Huang SZ, Zhou LJ. Clinical observation of 49 cases of Spondylosis treated with Fu's subcutaneous needling. *J Cardiovascu Dis Integra Chin Western Med Electronic*. 2014;(4):15–17.
22. Clinical value of Fu's subcutaneous needling in the treatment of spondylosis in nerve root losis. *Jiangxi Trad Chin Med*. 2015. 1: 62–63.
23. Zhang Y, Wang RX. Clinical effective rate of Fu's subcutaneous needling in cervical Spondylosis. *J Guangming Trad Chin Med*. 2016;31 (16):2378–2381.
24. Wang YJ, Qiu WJ. Clinical observation of spondylosis with Fu's subcutaneous needling in the treatment of vertebral artery type. *Rheumatol Arthritis*. 2017;6(09):28–29+67.
25. Chang M. Clinical study of Fu's subcutaneous needling therapy with massage in the treatment of nerve root Spondylosis. *J Dietary Health Care*. 2018;5(30):93–94.
26. Kang MR, Zhang B, Chen LD. Clinical study of Fu's subcutaneous needling in the treatment of nerve root Spondylosis. *Clin J Acupunct Moxibust*. 2018;34(6):52–54.
27. Li WS, Li SH, Fan YL, et al. Observation of therapeutic effect of Fu's subcutaneous needling acupuncture on Spondylosis in 200 cases. *Diabetes World*. 2018;15(5):28–30.
28. Su F, Xia W, Chen LX. Clinical Effective rate and nursing care of 50 cases of spondylosis with Fu's subcutaneous needlings in vertebral artery disease. *Inner Mongolia Tradl Chin Med*. 2018;37(3):65–66.
29. Chen W. Effect of Fu's subcutaneous needling and ordinary acupuncture in the treatment of Spondylosis and cervical losis. *World Latest Med Inform Digest*. 2019;19(02):136–137.
30. Wang H, Hu GY. Effective rate of Fu's subcutaneous needling combined with traditional Chinese medicine and ironing in immediate analgesia of spondylosis in acute cervical phase. *Massage Rehab Med*. 2019;10(02):28–30.
31. Chen QL, Xie JX, Wang XY, et al. Effective rate of Fu's subcutaneous needling therapy combined with thunderfire moxibustion in the treatment of spondylosis in nerve root losis. *J Prac Chin Med*. 2019;36(08):1067–1069.
32. Hu Y, Zhong SF, Zhang GQ, et al. Effective rate of Fu's subcutaneous needling "long range bombardment" and electric acupuncture in the treatment of spondylosis with nerve root losis. *Hainan Med*. 2019;31(10):1263–1265.
33. Li JJ, CAI HY, Luo HY. Clinical Effective rate and effect of Fu's subcutaneous needling therapy on vertebrobasilar blood flow in the treatment of vertebral arterial spondylosis. *Massage Rehab Med*. 2019;11(21):10–12.
34. Li YX, Yu Y, Gao S, et al. Fu's subcutaneous needling combined with reperfusion activity in the treatment of Qi-stagnation and blood-stasis type neck and shoulder syndrome. *Inform Chin Med*. 2020;37(5):98–101.
35. Peng GR, Xue X, Wang PA, et al. Clinical observation of spondylosis with Fu's subcutaneous needling therapy combined with acupuncture at Jiaji point of neck. *Shi Zhen Chinese Medicine*. 2020;31(12):2974–2977.
36. Sun ZY, Shen S, Shen Y. Clinical effect of Fu's subcutaneous needling in cervical Spondylosis. *Curr Med*. 2019;26(23):123–124.
37. Yuan SM, Zhao XY. Effective rate of Fu's subcutaneous needling in the treatment of Spondylosis neck, shoulder and back pain. *J Dietary Health Care*. 2019;7(20):96–97.
38. Zhong X. Effects of Fu's subcutaneous needling therapy with reperfusion activity on hemorheology and pain of cervical spondylosis. *Modern Med Health Res*. 2020;4(5):80–82.
39. Zhou YH, Li CX, Cui CW, et al. Clinical effect of improved Fu's subcutaneous needling with continuous nursing in vertebral artery Spondylosis. *Inter J Infect Dis*. 2019;9(1):143–145.
40. Bai YF, Yang F. Effective rate and safety evaluation of Fu's subcutaneous needling and electric acupuncture in the treatment of spondylosis of nerve root. *Chin Foreign Med Res*. 2021;19(36):125–127.
41. Chen J, Jiang H. Clinical observation of Qushi Juanbi decoction combined with Fu's subcutaneous needling in treatment of nerve root spondylosis. *Chin J Guangming Trad Chin Med*. 2019;36(6):935–937.
42. Lin YH. Curative effect of Fu's subcutaneous needling with electric acupuncture in the treatment of nerve root Spondylosis. *J Prac Chin Med*. 2021;37(4):698–699.
43. Luo ZP. Clinical observation of Fu's subcutaneous needling in the treatment of spondylosis induced dizziness. *Wisdom and Health*. 2019;7 (30):114–116.
44. Mo XX, Chen SF, Huang KM, et al. Clinical study of Fu's subcutaneous needling combined with traditional Chinese medicine directional permeation losis in mixed spondylosis. *Clin Res Trad Chin Med*. 2021;13(29):94–97.
45. Wang B, Liu KY, Zhao X, et al. Effect of Fu's subcutaneous needling combined with reperfusion activity in acute phase of Spondylosis and effect on physiological curvature of cervical vertebra. *Inform Chin Med*. 2021;38(4):67–71.
46. Xu S. Clinical Research on the Treatment of Spondylosis with Fu's subcutaneous needling Therapy Combined with Cervical Exercises. *Massage Rehabil Med*. 2021;12(12):21–23.
47. Zhu X, Fan BJ, Li HM, et al. Clinical study of Fu's subcutaneous needling reperfusion combined with Gastrodia Guteng Yin in the treatment of acute spondylosis in young and middle-aged patients. *Chin J Acute Med*. 2021;30(9):1593–1597.
48. Huang C-H, Tsai L-HL-H, Sun M-F, et al. Rapid improvement in neck disability, mobility, and sleep quality with chronic neck pain treated by fu's subcutaneous needling: a randomized control study. *Pain Res Manag*. 2022;2022:7592873. doi:10.1155/2022/7592873
49. Cao L, Zeng Z, Li PF. Clinical study of Fu's subcutaneous needling combined with maxillar-occipital traction in patients with nerve root Spondylosis. *J Hunan Normal Univ*. 2022;19(4):69–73.
50. Han SY, Tang CZ, Cui SY, et al. Clinical observation of Fu's subcutaneous needling therapy combined with curved straight losis in the treatment of cervical spondylosis. *J Guangzhou Univ Trad Chin Med*. 2022;39(8):1803–1808.

51. Peng JP, Zhou H, Hu XH, et al. Clinical effective rate of Fu's subcutaneous needling in cervical Spondylosis. *Chin J Med*. 2012;7(3):16–20.
52. Yang XF, Han C. Effective rate of Fu's subcutaneous needling and electric acupuncture in the treatment of spondylosis with vertebral artery type. *Chin Sci Technol Trad Chin Med*. 2022;29(2):332–333.
53. Cai L. Observation on the therapeutic effect of floating needles combined with conventional acupuncture in the treatment of cervical spondylosis of radiculopathy type. *J Prac Trad Chin Med*. 2023;39(6):1196–1198.
54. Li YF, Wang Z, Zhang X, et al. Clinical effect of Fu's subcutaneous needling combined with syndrome differentiation traction in the treatment of spondylosis of nerve root. *Chin Med Rev*. 2019;20(30):151–154,159.
55. Li YF, Jiang YC, Yang X. Clinical observation of Fu's subcutaneous needling sweeping powder in the treatment of Spondylosis and blood stasis syndrome. *Chin Emerge Tradl Chin Med*. 2019;32(7):1219–1222.
56. Lu J, He JR, Wang XY, et al. Clinical observation of spondylosis with Fu's subcutaneous needling combined with patch therapy in cervical losis. *Henan J Trad Chin Med*. 2023;43(9):1405–1409.
57. Ma FJ. Curative effect of Fu's subcutaneous needling and reperfusion combined with Lin's bone manipulation in mixed spondylosis. *Chin Sci Technol J Database Med Hygiene*. 2023;(12):068–072.
58. Ren Y, Wu JM, Su J. Effect of Fu's subcutaneous needling combined with Mulligan manipulation on serum TXB2, TNF-α, NSE and hemodynamics of vertebral arterial spondylosis. *Shanghai J Acupunct Moxibust*. 2019;42(11):1177–1183.
59. Wang Y. Effective rate and safety evaluation of Fu's subcutaneous needling and electric acupuncture in the treatment of nerve root spondylosis. *Chin Scie Technol J Database Med Health*. 2023;(6):163–166.
60. Wu JM, Ren Y, Su J. Clinical research on the treatment of vertebral artery type spondylosis with mulligan technique combined with floating needles. *J Acupunct Moxibust Clin Res*. 2023;39(10):28–32.
61. Li YW, Liu Y. Clinical observation of Fu's subcutaneous needling in the treatment of spondylosis of vertebral artery with Tongtuo method. *J Trad Chin Med Guangxi*. 2018;47(01):31–34.
62. Tian YL. Effect of Fu's subcutaneous needling combined with hyperbaric oxygen in the treatment of vertebral arterial spondylosis patients. *J Prac Clin Integ Trad Chin Western Med*. 2018;24(21):23–25+78.
63. Xie LL. Clinical effect of Fu's subcutaneous needling in the treatment of spondylosis. *Chin J Pract Med*. 2019;19(22):156–158.
64. Yang JX, Fu ZH. Analysis on the theory and clinical research of Fu's subcutaneous needling. *Western Chin Med*. 2015;28(6):156–158.
65. Wen X, Liu T, Wang XY. A randomized controlled trial of Fu's subcutaneous needling therapy for scapulohumeral periarthritis. *Massage Rehab Med*. 2018;9(23):16–18.
66. Hu ZX, Chen LQ, XW LI. Curative effect of Fu's subcutaneous needling therapy with reperfusion activity in the treatment of Spondylosis with vertebral artery. *Chin J Gen Med*. 2018;16(6):1001–1003.
67. Sun XW, Pan TT, Liu TT, et al. Theoretical and clinical research progress of Fu's subcutaneous needling therapy for scapulohumeral periarthritis. *Clin J Acupunct Moxibust*. 2019;36(04):90–93.
68. Money S. Pathophysiology of trigger points in myofascial pain syndrome. *J Pain Palliat Care Pharmacother*. 2017;31(2):158–159. doi:10.1080/15360288.2017.1298688
69. Zhang WB, Tian YY, Li H, et al. A discovery of low hydraulic resistance channel along meridians. *J Acupunct Meridian Stud*. 2008;1(1):20–28. doi:10.1016/S2005-2901(09)60003-0
70. Fu ZH. Reperfusion and reperfusion activity: on the method of activity while treatment in external therapy. *Chin Acupunct Moxibust*. 2015;35(S1):68–71.
71. Li LL, Chen L, Li X, et al. Research progress of supramolecular collagen liquid crystal structure in animal connective tissue. *Bulletin of Polymers*. 2013;(8):36–44.
72. Zhang YH, Wu T, Shen W, et al. Effect of floating target on thickness and elasticity of neck and shoulder pain muscle based on ultrasonic elastic imaging. *Chin J Acupunct Moxibust*. 2020;40(09):939–941.
73. Qin ZX, Feng HQ, Wang YH. Clinical observation of the synergistic effect of Fu's subcutaneous needling therapy on scapulohumeral periarthritis. *J Guiyang College Trad Chin Med*. 2019;41(2):46–49.