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REVIEW

Acupuncture for the Treatment of Cervical Spondylotic Radiculopathy: An Overview of Systematic Reviews

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Background: Acupuncture has been extensively applied in the clinical management of cervical spondylotic radiculopathy (CSR). This overview aims to systematically summarize the efficacy and safety of acupuncture for the treatment of CSR, as well as to assess the methodological rigor and quality of evidence of the included studies.

Methods: A comprehensive literature search for systematic reviews and meta-analyses was conducted across four Chinese and five international databases (PubMed, Web of Science, Cochrane Library, MEDLINE, Embase, China National Knowledge Infrastructure Database, Wanfang Database, Chinese Biomedical Literature Database, and Chongqing VIP).The literature search was conducted from the inception of each database to May 2025 (1996–2025). The PRISMA 2020 statement, AMSTAR 2, ROBIS, and GRADE tools were used to assess reporting quality, methodological quality, risk of bias, and evidence strength. Qualitative and quantitative evaluations were also performed on the results.

Results: Six SR/MA studies were included. One study had relatively complete reporting with a PRISMA score of 24.5, while five showed reporting deficiencies (scores 18–20). All six studies scored very low on methodological quality according to AMSTAR 2. Only one study was rated as low risk of bias by ROBIS, while five were high risk. GRADE assessment of 41 outcomes showed 2.4% moderate quality, 24.3% low quality, and 73.2% very low quality, mainly downgraded due to study design limitations and publication bias.

Conclusion: Acupuncture combined with conventional treatment may provide therapeutic benefits for CSR patients compared to conventional treatment alone. However, the safety of acupuncture for CSR has not been systematically evaluated, and the overall evidence quality is low, so conclusions should be interpreted cautiously.

Keywords: acupuncture, cervical spondylotic radiculopathy, overview, AMSTAR 2, GRADE, systematic review

Introduction

Cervical spondylosis (CS) is a highly prevalent condition, with an estimated prevalence of 13.76% in China.[1] Cervical intervertebral disc protrusion (CSR), as one of the key pathological processes in the development of cervical spondylosis, has the highest incidence rate, accounting for approximately 60% to 70% of all cervical spondylosis cases, with a peak onset age around 60 years.[2] The annual incidence of cervical radiculopathy has been reported as 107.3 per 100,000 individuals in males and 63.5 per 100,000 in females.[3] A recent study conducted by the US military found an annual incidence rate of 1.79 per 1,000 people.[4] Due to factors such as population aging, lifestyle changes, and increasing work- or life-related stress, the incidence of CSR has been steadily rising.[5]

The anatomical relations of the intervertebral foramen mean that lateral disc bulges/protrusions, uncinated joint osteophytes, and facet joint hypertrophy can all lead to foraminal narrowing and cervical nerve root compression.[6]

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Radicular symptoms may cause diagnostic difficulty, leading to shoulder or chest pain in the case of C5 and C6 radiculopathy respectively.[7] Therefore, accurate diagnosis of CSR imaging is of critical importance.Imaging diagnosis of CSR can be primarily summarized as follows: ① CR films are particularly effective for visualizing changes in the physiological curvature of the cervical vertebrae, including straightening and reverse bow deformities, osteophyte formation, narrowing of intervertebral spaces, vertebral body instability or slippage, and alterations in the intervertebral foramina. ② CT scans are particularly effective for visualizing osteophytes of the Luschka and intervertebral joints, intervertebral disc protrusions, as well as cartilaginous nodules and calcifications at the posterior margin of the vertebral body. ③ MRI films are particularly effective for visualizing spinal cord compression caused by intervertebral disc degeneration and protrusion, thickening of the ligamentum flavum, calcification, spinal canal stenosis, as well as spinal cord edema, degeneration, and necrosis.[8]

Clinically, CSR primarily presents with radicular symptoms such as pain and numbness, including neck pain, arm pain, finger numbness, and arm weakness. Additional symptoms, such as dizziness and vomiting, may also occur due to nerve root compression, significantly affecting patients' daily lives and work performance. A significant risk factor for CSR is overload associated with non-ergonomic head bending. A 60-degree bend places 26–27 kg of load on the cervical spine.Therefore, there is an urgent need for effective therapeutic interventions to alleviate symptoms and improve patients' quality of life.Given the potential risks associated with cervical spine surgery—such as accelerated adjacent segment degeneration, dysplasia, hematoma formation, and recurrent laryngeal nerve palsy—both clinicians and patients generally prefer conservative treatment strategies when managing CSR.[9] Common conservative approaches include manual therapy, functional rehabilitation exercises, acupuncture, pharmacological treatment, and others. Most patients with CSR experience symptom relief through conservative management, such as medication, cervical traction, acupuncture, or the use of a cervical collar.[10,11]

Acupuncture is a fundamental component of traditional Chinese medicine (TCM) and serves as an effective alternative therapeutic approach for pain management.[12,13] Existing clinical studies demonstrate that both traditional acupuncture and emerging treatment modalities, such as mesotherapy, can yield relatively satisfactory clinical outcomes.[14–16]Compared to other conservative interventions, acupuncture is associated with fewer adverse effects.[17,18] Emerging evidence suggests that the potential mechanisms underlying acupuncture's therapeutic effects on CSR may involve the inhibition of AMPAR and NMDAR expression, modulation of neurotransmitter concentrations, and enhancement of spinal synaptic plasticity.[19] Additionally, acupuncture may exert analgesic effects by modulating central sensitization, potentially through the suppression of the CaMKII/CREB/BDNF signaling pathway.[20] In recent years, numerous randomized controlled trials (RCTs), SRs, and MAs regarding acupuncture for CSR have been published, aiming to summarize the available efficacy and safety data in comparison with control groups.[21,22] However, some SRs and MAs report conflicting findings, which may be attributed to variations in sample sizes and methodological quality of the included studies. Therefore, it is essential to critically assess the quality of existing SRs and MAs in order to derive a consistent and reliable conclusion prior to informing clinical practice. A systematic review of systematic reviews refers to the synthesis of evidence from multiple relevant SRs, with the objective of generating high-quality, consolidated evidence for clinicians and policymakers.[23] To address the limitations inherent in individual SRs or MAs and to provide more comprehensive evidence, a systematic overview of SRs and MAs is warranted.[24]

The objective of this review is to evaluate the methodological rigor and quality of evidence pertaining to acupuncture as a treatment for CSR, with the aim of providing more reliable clinical evidence to guide the management of CSR patients.

Materials and Methods

The protocol of this overview was registered on the International Prospective Register of Systematic Reviews (PROSPERO;http://www.crd.york.ac.uk/PROSPERO/;registration number, CRD42024619159). This study method adheres to the relevant requirements of the Cochrane Handbook, the report complies with the PRISMA 2020 checklist.

Search Strategy

A systematic electronic literature search was conducted independently by two researchers across five international databases (PubMed, EMBASE, Cochrane Library, Medline, and Web of Science) and four Chinese electronic databases (China National Knowledge Infrastructure Database, Wanfang Database, Chinese Biomedical Literature Database, and Chongqing VIP). The search period covered all records from the inception of each database up to May 31, 2025. The detailed search strategy is presented in Supplemental A.

Inclusion Criteria

1. Study Design: SRs/MAs included RCTs of acupuncture for patients with CSR and performed meta-analysis.Study Participants: Reference to the "Expert consensus on the standardization of diagnosis and treatment of cervical spondyloticradiculopathy"[25] included patients with CSR who met the following diagnostic criteria (age and sex not restricted). ① Local nerve root compression can occur under the following conditions: spinal canal stenosis, intervertebral foramen compression, or extraspinal neuromuscular compression within the cervical musculature. Meeting any one of these criteria is sufficient for diagnosis. ② Positive brachial plexus pull test or neck compression test. ③ X-ray, CT or MRI showed hyperostosis or osteophytes around the nerve roots or foraminal stenosis caused by cervical degenerative disease.④excluding scapulohumeral periarthritis,thoracic outlet syndrome and other diseases, mainly with upper limb pain.
2. Study Intervention: Treatment group intervention included various acupuncture therapy (acupuncture, electroacupuncture, etc.) and acupuncture combined with other therapies.
3. Study Comparison: Control group intervention included comfort therapy (placebo, sham acupuncture or blank control) and other therapies (medication therapy or nondrug therapy, etc).
4. Study Outcome Measures: At least one of the prespecified outcomes was reported: the effective rate of acupuncture in the treatment of CSR, McGill Pain Questionnaire(MPQ), visual analogue scale (VAS). The pain intensity, physical function improvement, social function score, overall health status, the safety of acupuncture and other indicators.

Exclusion Criteria

1. Non-major intervention of acupuncture in the treatment group or acupuncture as an intervention in the control group.
2. Inclusion of non-randomized controlled trial literature within SRs/MAs.
3. Duplicate published literature.
4. Non-SRs/MAs, comments, conference abstracts, and studies on which the data could not be extracted.

Literature Screening and Data Extraction

All retrieved relevant records were imported into NoteExpress software for management. Duplicate entries were removed using the built-in duplicate-checking function. Two trained and pre-tested investigators independently screened the titles and abstracts, excluding studies that did not meet the predefined inclusion criteria. Subsequently, they reviewed the full texts of potentially eligible studies, performed independent assessments, and cross-verified their selections. Any discrepancies were resolved through discussion or referred to a third researcher for arbitration. Data extraction was conducted using Microsoft Excel, where a standardized self-designed data extraction form was employed to organize the final set of included studies. The extracted information encompassed details such as the first author, year of publication, number of included studies, sample size, methodological quality assessment tools, intervention descriptions, outcome measures, and key conclusions.

Quality of Reports

The quality of the reports included in the systematic reviews and meta-analyses was evaluated using the PRISMA 2020 statement.[26] This statement consists of 7 primary items and 27 secondary items. Each item is scored as 1 point for

Table 1 Quality Classification of the AMSTAR 2 Tool.[28]

Confidence in the Results of the Review	Definition
High	No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest
Moderate	More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review
Low	One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest
Critically low	More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

"complete reporting", 0.5 points for "partial reporting", and 0 points for "no reporting". The total score ranges from 21 to 27, with scores of 21–27 indicating relatively complete reporting information, 15–21 indicating certain deficiencies in reporting information, and 0–15 indicating severe deficiencies in reporting information.[27]

Assessment of Methodological Quality

Two trained and pre-tested independent researchers used the Assessment of Multiple Systematic Reviews (AMSTAR 2) tool[28] and the Grading of Recommendations Assessment, Development,and Evaluation (GRADE) tool[29] to assess the methodological quality and evidence quality of the included literature. If a disagreement occurs, it is referred to a third researcher for arbitration.

The AMSTAR 2 scale was used to evaluate the methodological quality of the included studies in the SR/Meta analysis.[30] This scale consists of 16 items, of which 7 items (items 2, 4, 7, 9, 11, 13, and 15) are crucial. Each item is marked as "fully compliant" as "Y", "partially" as "PY", and "no" as "N".According to the evaluation results and the criticality of the entries, four quality levels are evaluated: high, moderate, low and critically low. ≤1 non-critical entry defect is rated as high, >1 non-critical entry defect is rated as medium, 1 critical entry defect with or without non-critical entry defect is rated as low, >1 critical entry defect with or without non-critical entry defect is rated as critically low.[31] The specific criteria for the evaluation of the AMSTAR 2 tool were detailed in Table 1.

Grading of the Quality of Evidence

The evidence quality was evaluated using the GRADE tool from five aspects: risk of bias, inconsistencies, indirectness, inaccuracy, and publication bias. A score of "0" indicates no downgrade, "-1" represents a 1-level downgrade. Based on the results, the evidence was classified as "high grade" (no downgrade), "medium grade" (1-level downgrade), "low grade" (2-level downgrade), and "very low grade" (3-level downgrade).[32,33]

Assessment of Bias

The risk of bias for the studies included in the systematic review/meta-analysis was evaluated using the ROBIS tool. The ROBIS tool consists of "Domain Two" and "Domain Three"."Domain Two" consists of 4 questions, namely study eligibility criteria, identification and selection of the studies, data collection, and synthesis and discovery; "Domain Three" is used to assess the overall bias situation. Based on the assessment results, the bias is classified as "High risk", "Low risk", or "unclear risk".[34]

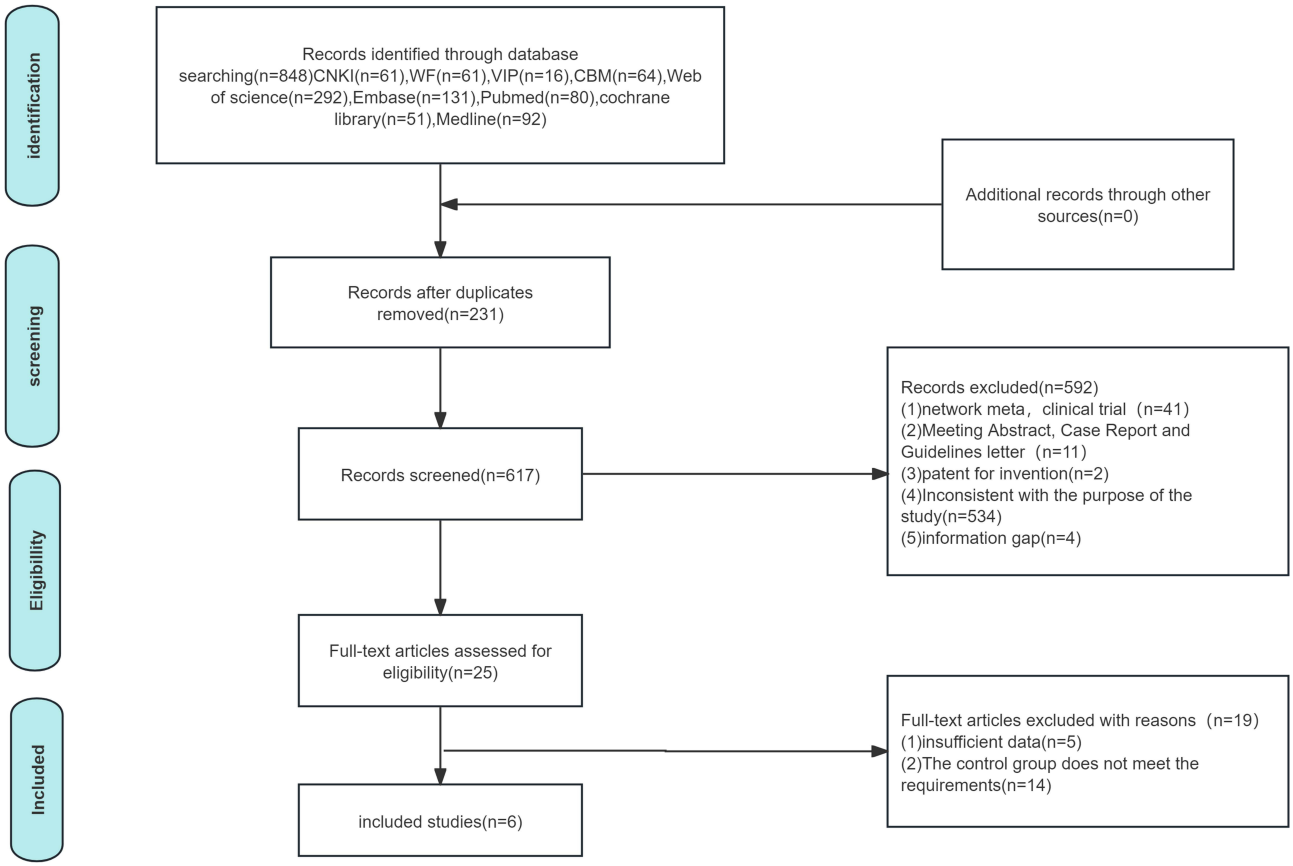

Figure 1 Flow diagram of the literature search and studies selection process.

Results

Literature Search and Selection

A total of 848 articles were initially identified. Of these, 231 were removed due to duplication, and 592 were excluded based on title and abstract screening. Following full-text review, 19 out of the remaining 25 articles were excluded. After independent evaluation by two reviewers, 6 SRs/MAs focusing on acupuncture as a treatment for CSR were ultimately included. The reasons for exclusion are summarized in Figure 1. A detailed list of excluded literature and corresponding reasons for exclusion is provided in Supplemental B.

Characteristics of the SRs/MAs

Table 2 presents the characteristics of the 6 SR/MAs. All SR/MAs exclusively included randomized controlled trials (RCTs) published between database inception and 2025. Among them, 1 study[35] was published in English, while 5 studies[36–40] were published in Chinese. 4 studies[36–38,40] utilized the Cochrane risk of bias tool to assess methodological quality, whereas 2 studies[35,39] employed the Jadad scale for quality evaluation. The number of included studies within each SR/MA ranged from 8 to 43, with total sample sizes varying between 909 and 3,207 participants. In the treatment groups, interventions primarily consisted of acupuncture therapy (AT), electro-acupuncture therapy (EA), or acupuncture combined with other therapeutic modalities. Control group interventions mainly comprised cervical traction, massage therapy, and TDP lamp application (An instrument that produces therapeutic thermal effects through electromagnetic waves).

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Table 2 Characteristics and Classification of Included Reviews

Author (Year)Ref	Country	Number of RCT (Total Population)	Intervention		Outcome Measures	Quality Assessment Tool	Overall Conclusion
			Treatment Group	Control Group			
Sun2009[36]	China	8 (n=1546)	AT, EA, AA, MA, TR, TDP	TR, MA, TDP	Total effective rate, MPQ, adverse effects	Cochrane risk of bias tool	Acupuncture is effective in CSR treatment, and has certain advantages over traction therapy in effective rate and pain improvement; traction therapy combined with acupuncture can enhance the therapeutic effect of traction.
Hu2012[37]	China	14 (n=1542)	AT, EA, TR	TR	Total effective rate, adverse effects, analgesic efficacy, recurrence rate	Cochrane risk of bias tool	Acupuncture has superiority over traction in treating cervical spondylotic radiculopathy
Wen2016[38]	China	15 (n=1615)	AT, EA, MA, HM	TR	Total effective rate, adverse effects, MPQ, NPQ	Cochrane risk of bias tool	It is preliminarily considered that acupuncture therapy is better than traction therapy in treating cervical spondylotic radiculopathy The clinical efficacy of treatment is better, No serious adverse outcome was found in the currently included literatures, and the safety degree was relatively high.
Yin2018[39]	China	11 (n=909)	AT, TR	TR	VAS, PRI	Jadad score	Acupuncture has certain curative effect and advantage in treating cervical spondylotic radiculopathy
Yang2021[40]	China	43 (n=3207)	AT	MA, TR, WM	VAS, JOA	Cochrane risk of bias tool	Acupuncture treatment of CSR has a good clinical effect
Zhao2024[35]	China	27 (n=3124)	AT, EA, MA, TR	MA, TR	Total Effective Rate, MPQ, VAS, Safety Analysis of Acupuncture	Jadad score	Acupuncture is significantly more effective than traction therapy in the treatment of cervicalspondylosis and can reduce the pain index of patients with CSR.

Abbreviations: AT, acupuncture therapy,EA, electroacupuncture; AA, abdominal acupuncture; MA, massage; TR, traction; HM, herbal medicine; MPQ, McGill Pain Questionnaire; NPQ, Neuropathic Pain Questionnaire; PRI, pain rating index; WM, western medicine pharmacological treatment; JOA, Japanese Orthopaedic Association,TDP, An instrument that produces therapeutic thermal effects through electromagnetic waves.

Report Quality Evaluation Results

According to the evaluation results based on the PRISMA 2020 statement, 5 of the systematic reviews/meta-analyses scored between 15 and 20,[36–40] indicating the presence of certain reporting deficiencies. 1 review/meta-analysis achieved a score of 24.5,[35] suggesting relatively complete reporting (see Table 3).

Table 3 The Quality Evaluation Results of 6 Reports Included in the Report (PRISMA 2020 Statement)

Section and topic		Item	Sun 2009[36]	Hu20 12[37]	Wen 2016[38]	Yin 2018[39]	Yang 2021[40]	Zhao 2024[35]
Title	Title	1	1	1	1	1	1	1
Abstract	Abstract	2	0.5	0.5	0.5	1	1	1
Introduction	Rationale	3	1	1	1	1	1	1
	Objectives	4	1	1	1	1	1	1

(*Continued*)

Table 3 (Continued).

Section and topic		Item	Sun 2009[36]	Hu20 12[37]	Wen 2016[38]	Yin 2018[39]	Yang 2021[40]	Zhao 2024[35]
Methods	Eligibility criteria	5	1	1	1	1	1	1
	Information sources	6	0.5	0.5	1	1	1	1
	Search strategy	7	0	0	0	0	0	0.5
	Selection process	8	1	1	1	1	1	1
	Data collection process	9	0	0	1	1	1	1
	Data items	10	0.5	0.5	1	1	1	1
	Study risk of bias assessment	11	0.5	1	1	1	1	1
	Effect measures	12	1	1	1	1	1	1
	Synthesis methods	13	1	1	1	1	1	1
	Reporting bias assessment	14	0	1	1	1	1	1
	Certainty assessment	15	0	0	0	0	0	0
Results	Study selection	16	1	1	1	1	1	1
	Study characteristics	17	1	1	1	1	1	1
	Risk of bias in studies	18	0	0.5	1	1	1	1
	Results of individual studies	19	1	1	1	1	1	1
	Results of syntheses	20	1	1	1	1	1	1
	Reporting biases	21	1	1	1	1	1	1
	Certainty of evidence	22	0	0	0	0	0	0
Discussion	Discussion	23	1	1	1	1	1	1
Other information	Registration and protocol	24	0	0	0	0	0	1
	Support	25	0	0	0	0	0	1
	Competing interests	26	0	0	0	0	0	1
	Availability of data, code,	27	0	0	0	0	0	1
Total score			15	17	18	20	20	24.5

Methodological Quality

The results of the AMSTAR 2 assessment are presented in Table 2. The quality of 6 SRs/MA[35–40]was considered extremely low because they had more than one serious defect (items 2, 4, 7, 9, 11, 13, and 15) and multiple non-serious defects. The key factors affecting the methodological quality of SRs/MAs are item 2 (no report of the previous research plan), item 3 (all studies did not explain the type of studies included), item 7 (no study provided a list of reasons for excluding studies), item 10 (no report of the funding source of the included studies), and item 16 (no report of any potential sources of conflicts of interest) (Table 4).

Grading of the Quality of Evidence

The 6 SRs/MAs included a total of 41 outcome measures assessing the effectiveness of acupuncture in treating CSR. The results showed that a total of 30 outcome indicators were of extremely low quality evidence, 10 were of low quality, 1were of moderate quality, and none were of high quality. When scoring the indicators, we found that limitations (100%)

Table 4 The Included Studies Were Critically Evaluated by Using the AMSTAR 2 Tool

Author (year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Overall Quality
Sun2009[36]	Y	N	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N	Critically low
Hu2012[37]	Y	N	N	PY	Y	Y	N	Y	PY	N	Y	Y	Y	Y	N	N	Critically low
Wen2016[38]	Y	N	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Critically low
Yin2018[39]	Y	N	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Critically low
Yang2021[40]	N	N	N	PY	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Critically low
Zhao2024[35]	Y	Y	Y	PY	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Critically low
Numberof Y (%)	5(83.3)	1(16.7)	1(16.7)	0(0)	5(83.3	5(83.3)	0(0)	6(100)	5(83.3	1(16.7)	6(100)	6(100)	6(100)	6(100)	4(66.7)	1(16.7)	

Notes: Q1: Did the research questions and inclusion criteria for the review include the components of PICO? Q2: Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? Q3: Did the review authors explain their selection of the study designs for inclusion in the review? Q4: Did the review authors use a comprehensive literature search strategy? Q5: Did the review authors perform study selection in duplicate? Q6: Did the review authors perform data extraction in duplicate? Q7: Did the review authors provide a list of excluded studies and justify the exclusions? Q8: Did the review authors describe the included studies in adequate detail? Q9: Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Q10: Did the review authors report on the sources of funding for the studies included in the review? Q11: If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? Q12: If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? Q13: Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review? Q14: Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? Q15: If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? Q16: Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?.

Abbreviations: Y, yes; PY, partial yes; N, no.

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and publication bias (92.7%) were the main reasons for the downgrade. Inconsistency (39.0%) and Imprecision (68.3%) also lowered the overall evidence grade (Table 5).

Outcomes and Efficacy Evaluation

Total Effective Rate

Five studies[35–39] reported the overall effectiveness rate, involving a total of 13 pieces of evidence, including 7 low-level evidences and 6 extremely low-level evidences.2SR[30,36] indicates that acupuncture treatment for CSR has a higher overall effectiveness rate than traction ($P < 0.05$). 1SR and 1MA[35,39] reported that the overall effectiveness rate of the acupuncture + traction group was superior to that of the control group which used only traction ($P < 0.05$). 1SR[36] shows that the experimental group of acupuncture + traction + massage has a higher overall effectiveness rate than the control group of traction + massage ($P < 0.05$). 1SR[35] found that the overall effectiveness rate of electro-acupuncture for CSR is superior to that of traction ($P < 0.05$).

MPQ Score

The MPQ score consists of three components: the Pain Rating Index (PRI), the Visual Analogue Scale (VAS), and the Present Pain Intensity (PPI). A study[38] reported that the total MPQ score after acupuncture treatment for CSR was superior to that after traction ($P < 0.05$).

PRI Score

Four studies[35,36,38,39] reported the PRI scores, involving a total of 8 pieces of evidence, all of which were of extremely low level. The results of 2 studies[35,39] showed that the PRI(T) score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$); the result of 1 study[35] indicated that the PRI(S) score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$).

PPI Score

Four studies[35,36,38,39] reported PPI scores, involving a total of 5 pieces of evidence, all of which were of extremely low level. Three studies[35,36,39] showed that the PPI score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$); 1 study[39] showed that the PPI(S) score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$).

VAS Score

Five studies[35,36,38–40] reported VAS scores, involving a total of 9 pieces of evidence, including 2 pieces of moderate evidence, 1 piece of low-level evidence, and 6 pieces of extremely low-level evidence. 2 studies[35,36] showed that the VAS score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$); 1 study[36] showed that the VAS score of the acupuncture + traction + massage + TDP group was significantly better than that of the traction + massage + TDP group ($P < 0.05$); 1 study[40] showed that the VAS score of the acupuncture group was significantly better than that of the massage group ($P < 0.05$).

Other Evaluation Indicators

In addition to the above evaluation indicators, some SRs/MAs also evaluated acupuncture treatment for CSR from other indicators. One study[38] showed that the NPQ score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$); another study[38] indicated that the muscle tension score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$); yet another study[40] revealed that the CSR20 score of the acupuncture group was significantly better than that of the traction group ($P < 0.05$).

Safety Analysis of Acupuncture

5 studies[35–39] addressed the safety issues of acupuncture treatment for CSR. The main symptoms included fainting during the treatment, local skin pain, and bleeding. None of these events had any adverse effects on normal vital signs.

Table 5 CSR Acupuncture 6SR and GRADE Quality Grading of SA/MA

Author(Year)	Outcome Indicator	Experimental Group	Control Group	Research Quantum(n)	Reduction Factors					Pooled Effect Size	P	I^2/%	Quality of Evidence
					Limitations	Inconsistency	Imprecision	Publication bias	Indirectness				
Sun2009[36]	Total efficacy rate	AT	TR	4 (571)	−1[a]	0	0	−1[d]	0	RR=1.24, 95%CI (1.16, 1.32)	<0.001	16.5	L
	Total efficacy rate	AT+TR	TR	1 (91)	−1[a]	0	−1[c]	−1[d]	0	RR=1 (0.96, 1.16)	0.25	0	CL
	Total efficacy rate	AT+TR+MA	TR+MA	2(663)	−1[a]	0	0	−1[d]	0	RR=1.16, 95%CI (1.11, 1.22)	<0.001	0	L
	Total efficacy rate	AT+TR+MA +TDP	TR+MA +TDP	1(132)	−1[a]	0	−1[c]	−1[d]	0	RR=1.02, 95%CI (0.91, 1.14)	0.77	0	CL
	MPQ-PRI	AT	TR	2 (240)	−1[a]	−1[b]	−1[c]	−1[d]	0	WMD=2.29, 95%CI (−0.59, 5.17)	0.12	99.5	CL
		AT+TR+MA +TDP	TR+MA +TDP	1 (132)	−1[a]	0	−1[c]	−1[d]	0	WMD=−0.12, 95% CI为 (1.65, 1.41)	0.88	0	CL
	Vas	AT	TR	2 (240)	−1[a]	−1[b]	−1[c]	−1[d]	0	WMD=1.75, 95%CI 为 (0.95, 2.55)	<0.001	85	CL
	Vas	AT+TR+MA +TDP	TR+MA +TDP	1 (132)	−1[a]	0	−1[c]	−1[d]	0	WMD=1.15, 95%CI (1.08, 1.22)	<0.001	0	CL
	PPI	AT	TR	2 (240)	−1[a]	0	−1[c]	−1[d]	0	WMD=0.61, 95%CI (0.50, 0.71)	<0.001	0	CL
Hu2012[37]	Total efficacy rate	AT	TR	5 (615)	−1[a]	0	0	−1[d]	0	RR=1.20, 95%CI (1.13, 1.27)	0.20	33	L
	Total efficacy rate	AT+TR	TR	8 (698)	−1[a]	0	0	−1[d]	0	RR=1.14, 95%CI (1.09, 1.20)	0.61	0	L
Wen2016[38]	Total efficacy rate	AT	TR	6 (692)	−1[a]	0	0	−1[d]	0	OR=5.58, 95%CI (3.18, 9.80)	0.41	1	L
	Total efficacy rate	EA	TR	6 (635)	−1[a]	0	0	−1[d]	0	OR=3.83, 95%CI (2.20, 6.69)	0.93	0	L
	Total efficacy rate	AT+MA	TR	1 (113)	−1[a]	0	−1[c]	−1[d]	0	OR=17.64, 95%CI (2.24, 138.74)	0.006	0	CL
	Total efficacy rate	AT+MA+HM	TR	1 (79)	−1[a]	0	−1[c]	−1[d]	0	OR=1.84, 95%CI (0.69, 4.94)	0.22	0	CL

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	Total score of MPQ	AT	TR	1 (69)	−1[a]	0	−1[c]	−1[d]	0	MD=−3.04, 95%CI (−4.99, −1.09)	0.002	0	CL
	PRI	AT	TR	2 (180)	−1[a]	0	−1[c]	−1[d]	0	MD= −0.88, 95%CI (−1.35, −0.41)	0.87	0	CL
	PPI	AT	TR	2 (180)	−1[a]	0	−1[c]	−1[d]	0	MD=0.55, 95%CI (−0.74, −0.36)	0.72	0	CL
	VAS	AT	TR	3 (252)	−1[a]	0	−1[c]	−1[d]	0	MD=−1.05, 95%CI (−1.35, −0.74)	0.36	2	CL
	NPQ	AT	TR	1 (69)	−1[a]	0	−1[c]	−1[d]	0	MD= −2.78, 95%CI (−4.48, −1.08)	0.001	0	CL
	Muscle tone score	AT	TR	2 (144)	−1[a]	0	−1[c]	−1[d]	0	MD= −2.35, 95%CI (−3.06, −1.64)	<0.001	0	CL
Yin2018[39]	Total efficacy rate	AT+TR	TR	3 (250)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −1.69, 95%CI (−2.63, −0.75)	0.0005	95	CL
	PPI	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −0.41, 95%CI (−0.56, −0.26)	<0.001	48	CL
	VAS	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −1.43, 95%CI (−2.21, −0.65)	0.07	63	CL
	PRI(T)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −2.43, 95%CI (−4.06, −0.8)	0.003	85	CL
	PPI(S)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −1.63, 95%CI (−2.07, −1.20)	0.005	81	CL
	PRI(A)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD= −0.89, 95%CI (−1.39, −0.38)	0.12	54	CL
Yang2021[40]	VAS	AT	MA	28 (2276)	−1[a]	0	0	0	0	SMD= −1.01, 95% CI (−1.10, −0.92)	0.03	37	M
	VAS	AT	TR	9 (497)	−1[a]	0	0	−1[d]	0	SMD= −0.47, 95% CI (−0.65, −0.29)	0.99	0	L
	VAS	AT	HM	6 (434)	−1[a]	0	0	−1[d]	0	SMD= −1.55, 95% CI (−1.77, -1.34)	0.99	0	L
	CSR20	AT	MA	4 (254)	−1[a]	−1[b]	−1[c]	0	0	SMD= 1.12, 95%CI (0.85, 1.39)	0.003	78	CL

(*Continued*)

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Table 5 (Continued).

Author(Year)	Outcome Indicator	Experimental Group	Control Group	Research Quantum(n)	Reduction Factors					Pooled Effect Size	P	I^2/%	Quality of Evidence
					Limitations	Inconsistency	Imprecision	Publication bias	Indirectness				
Zhao2024[35]	Total efficacy rate	AT	TR	8 (572)	−1[a]	−1[b]	0	−1[d]	0	MD= 1.16, 95%CI (1.04,1.29)	0.009	63	CL
	Total efficacy rate	EA	TR	8 (688)	−1[a]	0	0	−1[d]	0	MD=1.13, 95% CI (1.08,1. 19)	<0.001	0	L
	Total efficacy rate	AT+TR	TR	6 (468)	−1[a]	0	0	−1[d]	0	MD=1.16, 95% CI (1. 07,1.24)	0.0001	27	L
	Total efficacy rate	AT+MA+TR	MA+TR	3 (716)	−1[a]	−1[b]	0	−1[d]	0	MD=1. 14, 95% CI (1.09,1.19)	0.64	89	CL
	VAS	AT	TR	4 (361)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD=−1.09, 95% CI (−1.94, −0.25)	0.01	83	CL
	VAS	AT+TR	TR	4 (382)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD=−1.01, 95% CI (−2.39,0.36)	0.15	99	CL
	PPI	AT	TR	3 (244)	−1[a]	0	−1[c]	−1[d]	0	MD = −0.41, 95% CI(−0.56, −0.26)	<0.001	48	CL
	PRI(A)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD=−0.89, 95% CI (−1.39, −0.38)	0.12	54	CL
	PRI(S)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD=−1.54, 95% CI [−2.57, −0.51]	0.003	81	CL
	PRI(T)	AT	TR	3 (244)	−1[a]	−1[b]	−1[c]	−1[d]	0	MD=−2.43, 95% CI (−4.06, −0.80)	0.003	85	CL

Abbreviations: AT, acupuncture therapy; EA, electroacupuncture; MA,massage; TR,traction; TDP,An instrument that produces therapeutic thermal effects through electromagnetic waves.;HM, herbal medicine; MPQ, McGill Pain Questionnaire; NPQ, Neuropathic Pain Questionnaire; PRI, pain rating index; VAS, Visual Analog Scale; CL, critically low; L, low; M, moderate; H, high; a, The design of the experiment with a large bias in random,distributive hiding or blind; b, The confidence interval overlaps less, the heterogeneity test P is Critically small, and the I2 islarger;c: Confidence interval is not narrow enough;d, Asymmetric funnel plot or fewer studies are included and there maybe greater publication bias.RR, relative risk; WMD, weighted mean difference; CI, Confidence interval; OR, odds ratio; MD, Mean Difference; SMD, standardized mean difference.

Table 6 Tabular Presentation of Risk of Bias of Included SRs/MAs

	Research Eligibility Criteria	Identification and Selection of Studies	Data Collection and Research Assessment	Synthesis and Discovery	Risk of Bias in the Review
Sun[36]	High	High	High	High	High
Hu[37]	High	High	High	High	High
Wen[38]	Unclear	High	Low	Low	High
Yin[39]	High	High	High	High	High
Yang[40]	Unclear	High	High	High	Low
Zhao[35]	Unclear	Low	Low	Low	High

Risk of Bias

The study eligibility criteria, research eligibility criteria for the included literature in 3 studies[35,38,40] were "uncertain", while for the other 3 studies[36,37,39] they were "high risk"; the identification and selection of studies for 5 studies[36–40] were "high risk", and 1 study[35] was "low risk"; the data collection and research assessment in 4 studies[36,37,39,40] were "high risk", and 2 studies[35,38] were "low risk"; the synthesis and discovery in 4 studies[36,37,39,40] were "high risk", and 2 studies[30,38] were "low risk"; the risk of bias in the review was "high risk" for 5 studies,[35–39] and "low risk" for the remaining 1 study.[40] The assessment of the risk of bias of each review is shown in Table 6 and Figure 2.

Discussion

Summary of Main Findings

SRs/MAs are the integrative analyses of the original research evidence, which are at a higher level in the evidence hierarchy.[41] The main conclusion of this study is that acupuncture treatment is more effective than the control group treatments such as traction and massage in relieving pain and improving the neurological function of the cervical spondylosis radiculopathy.while it is clinically recognized that acupuncture can be used to manage CSR, uncertainties remain regarding its effectiveness on specific symptom profiles and the potential occurrence of serious adverse events beyond commonly reported outcomes such as syncope and local bleeding. A large number of randomized controlled trials and systematic reviews have also confirmed the effectiveness

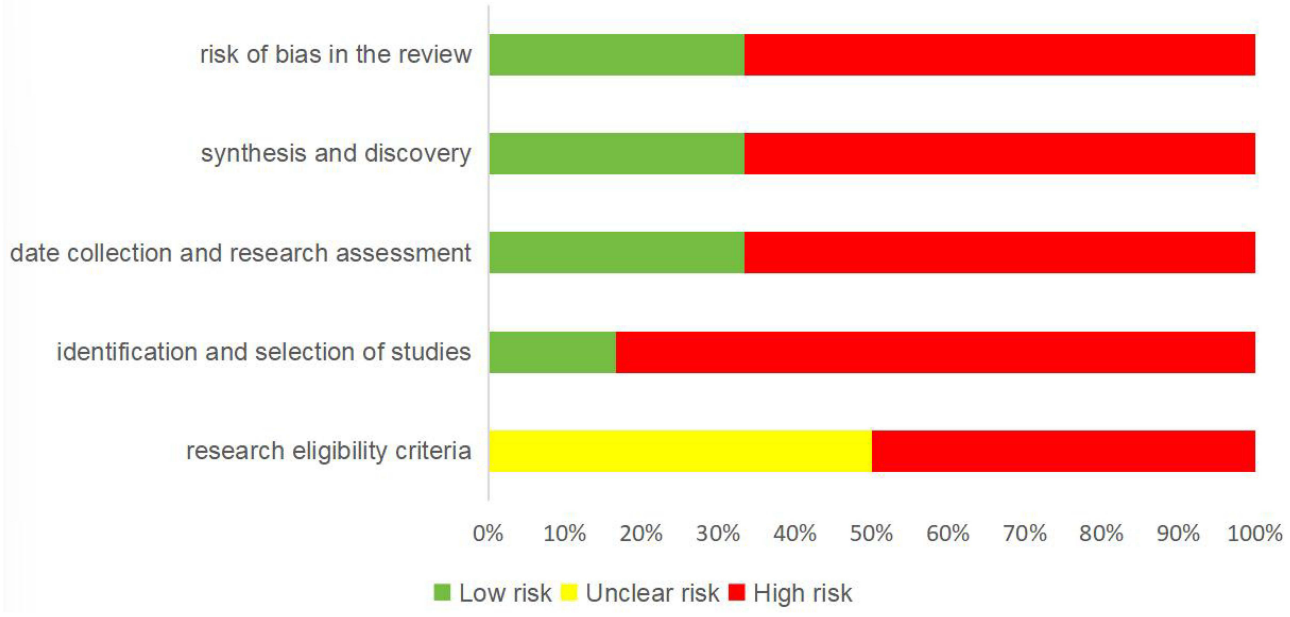

Figure 2 Graphical presentation of risk of bias of included SRs and MAs.

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of acupuncture treatment for CSR. However, the methodological evaluations of the 6 SR/MA studies and the quality of the outcome indicators were all low or very low.

Quality Analysis of SR and MA

Both the PRISMA 2020 statement and the AMSTAR 2 assessment reveal significant methodological shortcomings in the included SR/MAs on acupuncture for CSR.[42] As indicated by the AMSTAR 2 evaluation, missing information in the included studies was primarily concentrated in items 2 (16.7%), 4 (0%), and 7 (0%). The results demonstrated that at least one critical item was omitted in each of the six studies, resulting in an overall rating of critically low methodological quality.These findings suggest that future research should involve prospective registration of study protocols on recognized platforms such as Cochrane or PROSPERO to enhance transparency, improve reproducibility, and reduce the risk of bias. Additionally, researchers should conduct manual searches for relevant grey literature to develop a more comprehensive search strategy. Furthermore, none of the included SRs/MAs provided a list of excluded or included references, nor did they specify the reasons for exclusion.In addition to key methodological items, the absence of items 10 (16.7%) and 14 (16.7%) should also be taken seriously. These items highlight the importance of reporting funding sources for included studies and disclosing potential conflicts of interest in advance. Addressing these aspects can significantly improve the methodological rigor of future reviews and contribute to the development of high-quality clinical guidelines and evidence-based decision-making.

According to the PRISMA 2020 statement, the author recommends that researchers should employ appropriate methods to assess the methodological quality and strength of evidence in SR/MAs, clearly define the level of evidence supporting the findings, and thereby evaluate the robustness of the results. Furthermore, when heterogeneity is present among the outcome measures of included studies, sensitivity analysis or subgroup analysis should be performed to explore the sources of heterogeneity, enhance the reliability of the findings, and ensure transparency in reporting.[43] Researchers are also advised to disclose relevant information such as funding sources and potential conflicts of interest. It is important to note that although some items in the PRISMA 2020 statement and the AMSTAR 2 tool overlap, the evaluation objectives of these two instruments differ. Concurrent use of both tools facilitates a more comprehensive and rigorous assessment of review quality.

Risk of Bias

When applying the ROBIS tool to assess the risk of bias in the included studies, it was determined that only one study exhibited an overall "low risk" of bias, primarily in the domains of study identification and selection. This outcome was attributed to the absence of a detailed search strategy and the lack of manual searching for relevant grey literature, which contributed to a higher risk of bias during the literature retrieval process. Therefore, future researchers conducting systematic reviews or meta-analyses are advised to fully recognize the importance of transparency in research planning and reproducibility in literature searching, in order to minimize the risk of bias in their studies.[43]

Quality of Evidence

Using the GRADE evidence assessment to evaluate the quality of evidence in the included studies, it was found that among the 41 outcome measures, including 1 intermediate (2.4%), 10 low (24.3%), and 30 very low (73.2%), the quality of evidence for most measures was very low, indicating differences in the study results. Downgrading factors included (a) limitations: some of the RCTS included in the SR/ meta-analysis had shortcomings such as unclear randomization methods, hidden allocation and missing blinding, and some RCTS had patient dropout, but the dropout was not explained, resulting in reduced quality of the included RCTS. (b) Inconsistency: There was significant heterogeneity in the analysis of outcome measures included in SR/Meta. (c) Publication bias: Some RCTS have a small sample effect, and the inverted funnel plots are asymmetrical. (d) Imprecision: The small number of original studies and the small sample size led to imprecision in some outcome measures. Among them, limitations (100%) and publication bias (92.7%) were the main reasons for the downgrade. Therefore, it is recommended that researchers estimate sample size, standardize the design and implementation of clinical trials, and increase the search for grey literature to reduce bias.

At the same time, when evaluating the quality of evidence, it was found that some studies conducted subgroup analyses on the combined treatment of acupuncture, hoping to enhance the therapeutic effect through the combination of multiple treatments. However, the results showed that there was no statistically significant difference in the total effective rate of some combination treatments compared to acupuncture alone. For example, Sun Pan et al[36] found through subgroup analysis of acupuncture combined with various treatments that acupuncture combined with massage traction had certain advantages, but acupuncture combined with traction and acupuncture combined with traction massage TDP irradiation did not show significant therapeutic advantages. This question suggests that not all treatments can be combined, and in the practice of clinical treatment, evidence-based treatment regimens should be used as much as possible, such as those that have been analyzed to be more advantageous and have a higher level of evidence.

Safety Analysis

No adverse events affecting vital signs have been reported in the existing literature. However, safety concerns such as syncope, bleeding, and pain remain. By reviewing safety analyses of diseases treated with acupuncture, it was found that the conclusions of these studies are consistent with those of this paper, suggesting that the safety of acupuncture treatment appears to be well-supported at the current stage.[44] Future clinical studies should place greater emphasis on systematically reporting adverse events, analyzing the safety profile of acupuncture for CSR following adequate data accumulation, and further clarifying the overall safety of this intervention.

Research Directions and Strategies

In the imaging diagnosis of radiculopathic cervical spondylosis, the absence of up-to-date expert consensus and systematic discussion has led to outdated diagnostic concepts. Furthermore, inconsistent standards across clinical guidelines contribute to variability in the application of diagnostic criteria. Regarding acupuncture treatment, acupoint selection is critical, as different combinations may yield distinct therapeutic outcomes and adverse reaction profiles. However, there remains a lack of multicenter, large-sample randomized controlled trials to systematically evaluate the efficacy of various acupuncture point combinations in the management of radiculopathic cervical spondylosis. In addition, future research should prioritize the investigation of the underlying mechanisms of acupuncture combined therapies. Our analysis of the included studies revealed that certain acupuncture combination regimens did not demonstrate significantly superior outcomes compared to control groups. After accounting for uncontrollable variables, this finding may be attributed to suboptimal selection of combined interventions. In some clinical practices, effective therapies are occasionally combined empirically without theoretical justification for their synergistic use. Therefore, subsequent studies should first elucidate, at the mechanistic level, which specific treatments can enhance clinical efficacy when integrated with acupuncture. Based on these insights, well-designed clinical trials should be conducted to ultimately establish an evidence-based, optimized treatment protocol.

Limitations

In summary, compared with conventional treatment, acupuncture for CSR may offer certain therapeutic advantages; however, its safety profile requires further investigation.Nevertheless, due to the low quality of evidence for the outcome measures included in this review, the conclusions should be interpreted with caution. The limitations of this study include: (1) the evaluation was conducted by the authors using different assessment criteria, which may introduce a degree of subjectivity and potential bias; (2) only Chinese and English literature was included, potentially leading to language-related selection bias; and (3) due to the limited number of included studies, it was not feasible to perform stratified subgroup analyses based on factors such as treatment duration.

Conclusion

Compared with conventional treatment, acupuncture combined with conventional treatment may have certain therapeutic advantages for CSR. However, the safety advantages of acupuncture treatment for CSR have not yet been summarized. Moreover, due to the low quality of evidence for the outcome indicators included in the studies, the conclusions drawn need to be interpreted with caution.

Author Contributions

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

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Disclosure

No potential conflict of interest was reported by the authors.

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