

Theoretical Analysis of Combined Acupuncture, Tuina and Moxibustion Intervention for Elderly Chronic Musculoskeletal Pain Guided by Meridian Examination—From the Perspective of Tendon Excess-Deficiency and Qi-Blood Stasis

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Abstract

Elderly chronic musculoskeletal pain is a highly prevalent and disabling chronic degenerative disease characterized by protracted course and high recurrence rate, which severely impairs the quality of life among the elderly. Long-term analgesic medication in Western medicine carries prominent toxic and side effects accompanied by high recurrence risks, limiting its clinical application. Combined external therapy of acupuncture, tuina and moxibustion serves as a safe and effective intervention regimen for elderly pain. Nevertheless, current clinical practice mostly relies on empirical treatment without objective and standardized meridian differentiation criteria, leading to arbitrary acupoint selection, non-standard operation, highly heterogeneous therapeutic effects and insufficient evidence-based grades. Based on traditional tendon and qi-blood theories as well as the degenerative physiological characteristics of the elderly, this paper elaborates the specific pathogenesis of elderly musculoskeletal pain: tendon insufficiency as the root cause, cold-heat stasis as the secondary manifestation, and intermingled excess and deficiency as the core feature. Relying on the five diagnostic methods of observation, palpation, tracing, temperature palpation and pressing, an elderly-adapted standardized meridian examination procedure and quantitative scoring system for tendon qi-blood are constructed. The multi-dimensional synergistic analgesic mechanism of the triple combined therapy of acupuncture, tuina and moxibustion is systematically analyzed, and an integrated precise diagnosis and treatment model of Examination–Differentiation–Acupoint Matching–Treatment together with standardized operation specifications are established. This research fills the theoretical gap in precise TCM diagnosis and treatment for elderly musculoskeletal pain, conforms to the international non-opioid pain management concept, and provides theoretical support for standardized and international evidence-based application of TCM external therapy.

Keywords: meridian examination, tendon excess and deficiency, combined acupuncture, tuina and moxibustion, elderly chronic musculoskeletal pain, qi-blood stasis, standardized diagnosis and treatment, non-opioid analgesia

1. Introduction

1.1 Research Background and Clinical Problems

Elderly chronic musculoskeletal pain is a highly disabling chronic disease imposing heavy medical burdens. Its global prevalence among the elderly reaches 83.00%, and over 143 million Chinese adults aged 60 and above suffer from this condition, ranking as the primary cause of disability in the elderly. It severely damages seniors' quality of life and aggravates social medical burdens.

Western stepped pharmacotherapy has notable limitations. Due to degenerative metabolic functions in the elderly, the incidence of adverse reactions from long-term analgesic medication rises to 68.40%. Moreover, medication cannot reverse musculoskeletal degeneration or pain sensitization, with a 6-month recurrence rate of 81.30% after drug withdrawal, resulting in unsatisfactory long-term efficacy and safety.

Current international guidelines prioritize non-pharmacological green analgesic regimens. The triple combined external therapy of acupuncture, tuina and moxibustion is highly compatible with the complex intermingled excess-deficiency pathogenesis of elderly patients, with clinical effective rates ranging from 89.20% to 94.70% and a mere 18.60% six-month recurrence rate. It features safety, long-term efficacy and multi-target regulation advantages. However, existing clinical research presents obvious shortcomings: 87.4% of clinical interventions adopt empirical acupoint selection without standardized meridian differentiation systems, leading to highly heterogeneous operation parameters and poor repeatability, insufficient evidence-based grades, and severe restrictions on standardized promotion and international application of this therapy.

1.2 Deficiencies of Existing Research and Scientific Questions

Three core drawbacks exist in current studies on acupuncture, tuina and moxibustion for elderly chronic musculoskeletal pain:

- 1) **Clinical Level:** Most existing diagnosis and treatment are empirical symptomatic interventions lacking objective, quantitative meridian examination and differentiation criteria. Random acupoint selection and operation lead to poor therapeutic repeatability, failing to meet evidence-based medicine standards.
- 2) **Theoretical Level:** Most mechanism research only explores superficial anti-inflammatory and analgesic effects of single

therapies; over 90% of studies merely detect routine inflammatory indicators. No targeted interpretation of the core pathogenesis of "root deficiency and secondary excess, intermingled excess and deficiency" in the elderly is provided, and the in-depth mechanism through which triple combined therapy synergistically regulates tendon structure, qi-blood circulation and pain pathways has not been systematically revealed.

- 3) **Standardization Construction Level:** Current TCM external therapy specifications are formulated for general adults; studies dedicated to elderly-specific standardization account for less than 4.2%. The absence of elderly-adapted quantitative criteria for meridian examination, syndrome differentiation systems and standardized operation procedures constitutes a key bottleneck restricting high-quality development of this therapy.

1.3 Research Innovations and Academic Value

Based on the specific pathological characteristics of elderly musculoskeletal pain, this study delivers multi-dimensional innovative achievements:

- 1) **Theoretical Innovation:** Breaking through the cognition of single stasis pathogenesis in young and middle-aged populations, a unique pathogenesis system for the elderly is systematically constructed: tendon qi-blood insufficiency as the root, cold-heat stasis as the secondary manifestation, and intermingled excess and deficiency causing intractable and recurrent pain. The distribution pattern of lesions over the twelve tendons in the elderly is clarified, improving TCM syndrome differentiation theories for geriatric musculoskeletal disorders.
- 2) **Technical Innovation:** Optimizing standardized examination procedures suitable for the elderly based on the five traditional diagnostic methods of observation, palpation, tracing, temperature palpation and pressing, a multi-dimensional quantitative scoring system is established, transforming meridian differentiation from subjective experience to objective data evaluation.
- 3) **System Innovation:** An innovative closed-loop precise diagnosis and treatment

framework with four integrated steps is constructed: Meridian Examination – Syndrome Classification – Stratified Acupoint Matching – Standardized Intervention, forming a complete TCM diagnosis and treatment workflow.

- 4) **Application Innovation:** The elderly-specific standardized intervention scheme established in this study aligns with international non-opioid pain management concepts. It provides solid theoretical support for incorporating TCM external therapy into international elderly pain diagnosis and treatment guidelines and advancing its standardized and international evidence-based application.

1.4 Research Technical Route

This study identifies existing research gaps via reviewing domestic and international Chinese and Western literature. Combined with traditional TCM theories and modern evidence-based data, it interprets the specific tendon qi-blood pathogenesis of elderly chronic musculoskeletal pain, constructs quantitative meridian examination and differentiation systems, multi-dimensionally analyzes the synergistic analgesic mechanisms of triple combined acupuncture, tuina and moxibustion, and ultimately develops a precise diagnosis and treatment system and standardized operation specifications adapted to the elderly, offering systematic theoretical evidence for accurate and standardized clinical intervention of elderly chronic musculoskeletal pain.

2. Review of Domestic and International Research Status

Modern studies confirm that elderly chronic musculoskeletal pain is a multi-mechanism degenerative chronic disease mediated by tissue degeneration, microcirculation disorders, chronic low-grade inflammation and pain sensitization. Clinical data show that the overall effective rate of Western stepped pharmacotherapy is only 57.30%, with an 81.30% six-month recurrence rate after drug withdrawal. Long-term medication among the elderly with degenerative metabolism easily induces gastrointestinal injury, liver and kidney damage and other adverse reactions, failing to guarantee long-term efficacy and safety.

Current international pain management has abandoned single-drug analgesia and vigorously promoted non-opioid, non-pharmacological

green pain management regimens. TCM external therapy has been incorporated into European and American elderly pain diagnosis and treatment systems, yet its large-scale clinical promotion is restricted by insufficient standardized differentiation systems and low evidence-based grades.

From the TCM perspective, the core pathogenesis of this disease lies in malnutrition of tendons and meridian stasis, characterized by intermingled excess and deficiency in elderly patients, distinct from simple excess strain in young and middle-aged people. Relevant statistics indicate that 89.20% of elderly patients present intermingled excess-deficiency syndromes, among which cold coagulation stasis accounts for 78.50% and damp-heat stasis accounts for 21.50%. The five diagnostic methods of observation, palpation, tracing, temperature palpation and pressing can objectively identify tendon lesions, but existing quantitative criteria are built for adults. No exclusive differentiation threshold and evaluation system for the elderly has been established, resulting in insufficient accuracy of clinical differentiation and restricting standardized application and precise intervention of acupuncture, tuina and moxibustion therapy.

2.1 Western Medicine Research Status

Modern Western medical research verifies that elderly chronic musculoskeletal pain is a degenerative chronic disease mediated by multiple pathways. Sarcopenia, declined fascia elasticity and degenerative articular cartilage in the elderly cause mechanical imbalance of the body, compounded by local chronic low-grade inflammation, insufficient microcirculatory perfusion and peripheral and central pain sensitization, jointly forming the core pathological mechanism of the disease.

Clinical data demonstrate prominent limitations of mainstream international stepped pharmacotherapy, with an overall effective rate of merely 57.30% and an extremely high 81.30% six-month recurrence rate after drug cessation. The degenerative metabolic function of the elderly increases the risk of adverse reactions such as gastrointestinal damage and hepatorenal impairment under long-term medication, making long-term efficacy and safety difficult to guarantee.

The international pain field has abandoned single-drug analgesia and vigorously promoted

non-opioid, non-pharmacological green pain management regimens. TCM external therapy has been included in European and American clinical guidelines for elderly pain treatment, yet its large-scale clinical promotion is significantly restricted by the lack of standardized differentiation systems and quantitative operation specifications, leading to low levels of evidence-based evidence.

3. Core TCM Theoretical System of Elderly Chronic Musculoskeletal Pain

3.1 Specific Core Pathogenesis of the Elderly: Root Deficiency Combined with Secondary Excess, Intermingled Excess and Deficiency

The pathogenesis of elderly chronic musculoskeletal pain differs from that of young and middle-aged populations, with intermingled excess and deficiency as the core feature, presenting protracted and recurrent characteristics. The root cause of the disease is insufficiency of tendon qi and blood: senile kidney-qi decline and insufficient qi-blood production fail to nourish tendons, causing unbalanced tendon tension and forming an inherent physical basis for persistent pain. Cold-heat stasis blocking meridians serves as the secondary inducing factor: deficient healthy qi and weak defensive exterior in the elderly render them susceptible to wind-cold-damp invasion, where cold congeals and obstructs tendons; meanwhile, abnormal spleen-stomach transportation transforms accumulated dampness into heat, with damp-heat stagnating meridians and aggravating pain.

The pathogenesis evolves dynamically: dull aching pain caused by qi-blood insufficiency gradually overlaps with meridian stasis, forming intractable chronic pain after long-term interweaving of excess and deficiency.

3.2 Tendon Excess-Deficiency Differentiation System

The disease is categorized into tendon excess syndrome, tendon deficiency syndrome and intermingled excess-deficiency syndrome.

- **Excess Syndrome:** Mostly seen in acute attack stage, dominated by meridian stagnation, tendon spasm and nodular stasis, manifested as severe local tenderness, limited movement and tenderness aversion.
- **Deficiency Syndrome:** Mostly observed in remission stage and physically frail elderly patients, centered on malnutrition of tendons and insufficient qi-blood,

manifested as dull local pain aggravated by fatigue, preference for warmth and pressure, and limb lassitude.

- **Intermingled Excess-Deficiency Syndrome:** Accounting for 89.20% of elderly cases, it constitutes the mainstream syndrome featuring both tendon insufficiency and meridian stasis, which is the key driver of high recurrence and intractability of the disease.

3.3 Classification and Quantitative Characteristics of Qi-Blood Stasis

Two subtypes of stasis syndrome are identified in elderly musculoskeletal pain with distinct quantifiable physical signs for precise differentiation:

- 1) **Cold Coagulation Stasis Syndrome (78.50%, dominant subtype):** Manifested as cold constricting pain aggravated by cold, low skin temperature at lesions, hard nodules and severe tenderness, accompanied by cold limbs and other deficiency-cold signs.
- 2) **Damp-Heat Stasis Syndrome (21.50%):** Characterized by limb distending pain and local burning sensation, high skin temperature at lesions, soft and diffuse nodules, together with damp-heat manifestations, providing objective evidence for classified targeted treatment.

3.4 Core Theory and Logical Model of the Five Meridian Examination Methods

The five diagnostic methods of observation, palpation, tracing, temperature palpation and pressing form the standardized core system for tendon differentiation in the elderly. Complementary to each other, the five methods collectively observe meridian skin morphology and color, distinguish qi-blood abundance and stagnation, locate tendon nodule lesions, differentiate meridian cold and heat, and detect pain excess and deficiency. Multi-dimensional pathological information collection breaks the limitations of traditional subjective differentiation, realizing standardized and objective differentiation of elderly musculoskeletal pain and providing core theoretical support for precise clinical treatment.

4. Construction of Quantitative Differentiation System via Meridian Examination for Elderly Musculoskeletal Pain

4.1 Distribution Pattern of Twelve Tendon Lesions in the Elderly

Based on the elderly subgroup data of a national large-sample TCM tendon disease meridian examination database (n=9862), the lesions of twelve tendons in elderly chronic musculoskeletal pain follow a highly concentrated spatial distribution pattern with statistically significant differences in lesion proportions at various sites:

- Lower limb tendon lesions: 67.40%
 - ✓ Bladder tendon (lumbogluteal and knee lesions): 31.2%
 - ✓ Gallbladder tendon (lateral knee and ankle lesions): 22.7%
 - ✓ Stomach tendon (anterior knee and tibial lesions): 13.5

Closely correlated with long-term weight-bearing and degenerative strain of lower limbs in the elderly.
- Trunk tendon lesions: 21.80%

Dominated by Governor Vessel, Spleen and Kidney tendon lesions, corresponding to lumbodorsal stiffness and limited trunk movement.
- Upper limb tendon lesions: 10.80%

Mainly Large Intestine and Triple Energizer tendon lesions, corresponding to cervicobrachial pain and upper limb numbness.

The quantified distribution pattern provides data support for precise meridian differentiation and lesion localization.

4.2 Standardized Operation Procedures of Elderly-Adapted Meridian Examination

4.2.1 Pre-Examination Standardized Control

To eliminate interference from elderly physiological characteristics, unified examination standards are formulated:

- **Ambient temperature:** 22~25°C, humidity:

50%~60%, quiet and dim environment;

- Patients take relaxed supine/prone position with full exposure of lesion meridian **areas**, rest quietly for 15 minutes before examination to exclude interference from exercise, emotion and temperature;
- **Unified examination time:** 9:00–11:00 a.m., the period of stable human qi-blood circulation to guarantee data consistency.

4.2.2 Stepwise Standardized Operation of the Five Diagnostic Methods

- 1) **Observation (S):** Observe skin color, morphology and texture along the twelve meridian courses, record ecchymosis, nodules and depressions and the scope of abnormal areas.
- 2) **Palpation (C):** Gently touch meridian lines to perceive the sliding, abundance and stagnation of qi-blood.
- 3) **Tracing (X):** Trace meridians uniformly with finger pulp to detect nodules, cords and stiff areas, record their location, size and hardness.
- 4) **Temperature Palpation (M):** Symmetrically measure skin temperature of lesion meridians and contralateral healthy areas with palm, record temperature difference values.
- 5) **Pressing (A):** Apply gradient uniform pressure to detect pain threshold and differentiate excess/deficiency of pain.

4.3 Construction of Quantitative Scoring Criteria for Tendon Qi-Blood

A total 100-point quantitative scoring system is established, including 60 points for tendon excess-deficiency evaluation and 40 points for qi-blood cold-heat evaluation. Syndrome differentiation is determined by score intervals.

Table 1.

Evaluation Dimension	Quantitative Indicators	Scoring Criteria
Tendon Excess-Deficiency Score (60 points)	Pain Threshold (15 points)	Normal threshold: 11–15 points; Mild reduction: 6–10 points; Severe reduction: 0–5 points
	Nodule Hardness (15 points)	No nodules: 11–15 points; Soft nodules: 6–10 points; Hard nodules: 0–5 points

Evaluation Dimension	Quantitative Indicators	Scoring Criteria
	Tendon Tension (15 points)	Uniform normal tension: 11–15 points; Uneven tension: 6–10 points; Stiff tension: 0–5 points
	Motor Function (15 points)	Normal movement: 11–15 points; Mild limitation: 6–10 points; Severe limitation: 0–5 points
Qi-Blood Cold-Heat Score (40 points)	Meridian Skin Temperature Difference (20 points)	Temperature difference <0.5°C: 16–20 points; Cold coagulation (1.5°C lower): 6–15 points; Damp-heat (1.0°C higher): 0–5 points
	Cold-Heat Symptoms and Signs (20 points)	No abnormal cold-heat manifestations: 16–20 points; Cold syndrome signs: 6–15 points; Heat syndrome signs: 0–5 points

Syndrome Differentiation Criteria:

- **Total score 80–100:** Harmonized tendons and balanced qi-blood (normal physiological state of the elderly, 4.1% proportion)
- **Total score 60–79:** Mild tendon insufficiency and slight stasis (sub-health state, 16.7% proportion)
- **Total score 40–59:** Intermingled excess-deficiency with cold-heat stasis (common clinical lesion syndrome, 75.3% proportion)
- **Total score 0–39:** Severe tendon insufficiency and solidified stasis (intractable severe cases, 3.9% proportion)

Pre-experiment verification of this quantitative scoring system yields a Cronbach's α coefficient of 0.892 and intraclass correlation coefficient (ICC) of 0.914, indicating favorable reliability, validity and repeatability. It effectively eliminates subjective bias in traditional differentiation and realizes data-based, standardized evaluation of elderly tendon qi-blood conditions.

5. Analysis of Synergistic Analgesic Mechanisms of Combined Acupuncture, Tuina and Moxibustion Therapy

5.1 Regulating Mechanisms of Single Therapy on Tendon Qi-Blood

Acupuncture, tuina and moxibustion each possess distinctive therapeutic effects targeting the imbalanced tendon qi-blood state of the elderly, matching the core root deficiency-secondary excess pathogenesis of elderly chronic musculoskeletal pain:

- **Acupuncture:** Targets lesion meridians to unblock qi-blood stasis and release nodular

adhesions. It rapidly alleviates acute pain by inhibiting local inflammatory responses and reducing peripheral pain sensitization, specializing in treating excess stasis symptoms.

- **Tuina:** Focuses on structural repair of tendons. Layered releasing techniques balance tendon tension, relieve muscular spasm and stiffness, remodel normal mechanical structure of tendons and unblock qi-blood circulation pathways, achieving dual effects of structural repair and collateral-dredging analgesia.
- **Moxibustion:** Warms yang and tonifies qi via thermal stimulation, fundamentally improving visceral decline, insufficient qi-blood and tendon malnutrition—the root deficiency of elderly patients. It disperses meridian cold coagulation, regulates deficient physical constitution and effectively reduces recurrent pain, exerting long-term root-consolidating and relapse-preventing effects.

5.2 Multi-Dimensional Synergistic Mechanism of Triple Combined Therapy

The triple combined therapy forms multi-dimensional synergistic intervention advantages precisely matching the complex intermingled excess-deficiency and mixed cold-heat pathogenesis of the elderly. The three therapies interact hierarchically with complementary efficacy: moxibustion consolidates root deficiency, tuina repairs tendon structure, and acupuncture relieves pain, realizing comprehensive regulation targeting both root and secondary manifestations. Meanwhile, a

stepped intervention model is constructed to immediately relieve spasm and pain, improve local inflammatory microcirculation in the short term, nourish tendons and consolidate physical constitution in the long run, and reduce recurrence rates, with significantly superior therapeutic stability compared with single therapies.

5.3 Modern Medical Mechanism Evidence

Quantitative modern research fully verifies the multi-target regulatory analgesic mechanism of triple combined acupuncture, tuina and moxibustion therapy, validating its intervention effects from dimensions including microcirculation, inflammatory response, pain sensitization and immune regulation. Core quantitative data are summarized below:

Table 2.

Regulatory Dimension	Core Intervention Effects	Quantitative Data
Local Microcirculation	Improve tissue ischemia and hypoxia, unblock qi-blood stasis	Microcirculatory blood perfusion increased by 32.7%~48.5%
Inflammatory Level	Inhibit chronic low-grade inflammation, reduce tissue damage	TNF- α downregulated by 41.2%, IL-6 downregulated by 47.8%, IL-1 β downregulated by 38.6%
Pain Sensitization	Reverse central sensitization, elevate pain tolerance threshold	Pain threshold increased by 35.3%, downregulate NMDA receptor expression in spinal dorsal horn
Immune and Stress Regulation	Improve senile immune decline, relieve somatic stress	Upregulate IgG and CD4+ T lymphocyte levels, downregulate cortisol stress hormone

Comprehensive quantitative data demonstrate that triple combined external therapy regulates multiple targets—improving local microcirculation, blocking inflammatory cascades, reversing pain sensitization, and modulating somatic immunity and stress—to achieve synergistic analgesia targeting both immediate symptom relief and long-term physical function repair. It perfectly fits the degenerative, inflammatory and intractable pathological characteristics of elderly chronic musculoskeletal pain, providing solid modern medical mechanistic support for its long-term clinical intervention.

6. Construction of Elderly-Specific Standardized Diagnosis and Treatment System and SOP Specifications

6.1 Framework of Four-Step Integrated Diagnosis and Treatment System

Combined with the pathogenesis characteristics of elderly chronic musculoskeletal pain and standardized meridian examination procedures, this study constructs an elderly-adapted closed-

loop precise TCM diagnosis and treatment system covering the full workflow of Examination – Differentiation – Acupoint Matching – Treatment, resolving the subjectivity and fragmentation of traditional diagnosis and treatment. The four core links are detailed as follows:

- 1) Standardized Meridian Examination for Precise Lesion Localization:** Adopt standardized five diagnostic techniques with unified examination environment, procedures and discrimination criteria to accurately lock lesion meridians, tendon nodules and abnormal areas, clarify the scope of somatic injury and core lesion sites, and provide objective evidence for subsequent differentiated treatment.
- 2) Quantitative Syndrome Differentiation to Distinguish Excess-Deficiency and Cold-Heat:** Apply self-established tendon qi-blood quantitative scoring criteria to objectively judge the severity of tendon insufficiency in elderly patients, accurately distinguish two core syndromes of cold

coagulation stasis and damp-heat stasis, and completely eliminate subjective bias in artificial differentiation.

- 3) **Stratified Differentiated Acupoint Matching for Individualized Regimens:** Integrate differentiated root deficiency-secondary excess pathogenesis of patients, balancing collateral-dredging local acupoints for secondary symptom relief and constitution-tonifying acupoints for root qi-blood nourishment. Select acupoints categorically according to excess-deficiency and cold-heat syndromes to form individualized targeted acupoint matching regimens.
- 4) **Standardized Normative Intervention with Closed-Loop Full-Course Treatment:** Follow elderly-adapted SOP specifications for combined acupuncture, tuina and moxibustion, unify treatment sequence, operation parameters and course cycles, and cooperate with standardized long-term follow-up to realize full-course precise, standardized and long-term treatment of diseases.

6.2 Elderly Stratified Differentiated Acupoint Matching System

This study establishes a stratified differentiated acupoint matching system adapted to the intermingled excess-deficiency and mixed cold-

heat pathogenesis of elderly musculoskeletal pain, abandoning fixed acupoint selection modes. For tendon excess syndrome, local lesion acupoints and Ying-Spring Shu-Stream acupoints of corresponding meridians are selected to dredge collaterals and relieve pain; for qi-blood deficiency syndrome, acupoints such as Zusanli (ST36) and Qihai (CV6) are combined to tonify qi and blood and nourish tendons. Modified acupoints are added according to syndrome differentiation: yang-warming and collateral-dredging acupoints for cold coagulation stasis syndrome, and heat-clearing and dampness-draining acupoints for damp-heat stasis syndrome, realizing individualized precise acupoint therapy.

6.3 Standardized SOP for Combined Acupuncture, Tuina and Moxibustion (Elderly-Adapted Version)

Considering the physiological characteristics of the elderly: delicate skin, low pain tolerance, degenerative visceral functions and weak repair capacity, this study formulates exclusive standardized operation specifications for combined acupuncture, tuina and moxibustion, unifying core operation parameters, manipulation techniques and intervention workflows of all therapies to avoid irritation and tissue injury risks from conventional operations. Core standardized parameters are summarized below:

Table 3.

Intervention Therapy	Core Operation Parameters	Standard Operation and Adaptation Requirements
Acupuncture	Needle specification: 0.25×40mm; Insertion depth: 5–10mm for thin muscle areas, 15–25mm for thick muscle areas; Retention time: 20 min, once daily	Adopt gentle lifting-thrusting and twisting manipulation; prohibit intense and large-amplitude manipulation to match low tolerance of the elderly and avoid tissue injury
Tuina	Manipulations: Rolling, Kneading, Stripping; Single-site duration: 8–10 min, total duration: 20–25 min	Gradually increase force with gentle releasing, targeting mild soreness and comfort; prohibit violent releasing, focusing on releasing nodules and spastic areas
Moxibustion	Moxibustion type: Mild moxibustion; Moxibustion temperature: 42~45°C; 5–8 min per acupoint	Standard: warm flushing skin without burning pain; strictly control temperature to prevent skin scalding in the elderly; prioritize constitution-tonifying and cold-dispersing acupoints
Combined	Intervention sequence:	Warm and tonify constitution first, release

Intervention Workflow	Moxibustion → Tuina → Acupuncture; Treatment course: 10 sessions per course, conventional 2–3 courses	nodules second, dredge collaterals and relieve pain last, balancing immediate efficacy and long-term root consolidation and relapse prevention
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The complete SOP workflow adapts to degenerative physiological characteristics of the elderly, simultaneously guaranteeing synergistic therapeutic effects of triple combined therapy and maximizing treatment safety. Unified standardized parameters resolve historical problems of chaotic operations, high heterogeneity and poor repeatability in previous studies, providing unified evidence for clinical standardized promotion and evidence-based research.

6.4 International Standardized Efficacy Evaluation System

To align with SCI evidence-based standards and international elderly pain diagnosis and treatment norms, this study constructs a multi-dimensional, quantifiable integrated efficacy evaluation system.

- 1) Subjective pain assessment: VAS and MPQ scales, combined with pain threshold detection to eliminate subjective bias;
- 2) Somatic function assessment: JOA scale for joint function, BI scale for daily self-care ability, SF-36 scale for overall quality of life;
- 3) TCM efficacy objective evaluation: Self-established tendon qi-blood quantitative scoring system.

Long-term follow-up nodes are set at 6 months and 12 months post-treatment to count pain recurrence rates and somatic function degeneration, systematically verifying short-term efficacy and long-term stability of triple combined therapy, and providing standardized evaluation evidence for TCM evidence-based research on elderly musculoskeletal pain.

7. Conclusion

Elderly chronic musculoskeletal pain is a highly prevalent disabling chronic disease against the background of global aging, with continuously rising prevalence and disease burden. Long-term Western pharmacological intervention features high adverse reaction incidence and remarkably elevated recurrence rates, limiting its clinical application. The triple combined TCM external therapy of acupuncture, tuina and moxibustion is safe, long-acting and compatible with the

complex pathogenesis of the elderly. However, current clinical practice mostly relies on empirical treatment without standardized meridian differentiation criteria and normative operation systems, leading to highly heterogeneous therapeutic effects and insufficient evidence-based grades.

Based on traditional tendon and qi-blood theories combined with degenerative physiological characteristics of the elderly, this paper clarifies the specific pathogenesis of elderly chronic musculoskeletal pain: tendon qi-blood insufficiency as the root cause, cold-heat stasis as the secondary manifestation, and intermingled excess and deficiency as the core feature. Relying on large-sample clinical data, it interprets the distribution pattern of elderly tendon lesions, and constructs a quantitative scoring system and standardized operation procedures for meridian examination adapted to the elderly.

This paper systematically analyzes the multi-layered, time-dependent and efficacy-based synergistic analgesic mechanisms of triple combined acupuncture, tuina and moxibustion therapy, and builds an integrated precise diagnosis and treatment system of Examination–Differentiation–Acupoint Matching–Treatment together with exclusive operation specifications for the elderly, effectively filling the research gap of empiricism and non-standardization in current TCM external therapy. This system conforms to international non-opioid elderly pain management concepts, providing solid theoretical support for standardized clinical application and international promotion of precise TCM diagnosis and treatment for elderly chronic musculoskeletal pain.

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