

# A Study on the Pathogenesis of Spastic Cerebral Palsy in Traditional Chinese Medicine and Rehabilitation Intervention Approaches

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**Abstract:** *Spastic cerebral palsy is the most common disabling neurological disorder in children, accounting for 60%-70% of all cerebral palsy cases [1]. It is primarily characterized by increased muscle tone, delayed motor development, abnormal posture, and joint contractures. Modern medicine recognizes its pathological core as impaired motor control resulting from upper motor neuron damage [2]. Clinical interventions include physical rehabilitation training, occupational therapy, physical agent therapy, oral muscle relaxants, botulinum toxin injections, selective dorsal rhizotomy, and various orthopedic surgeries [3]. While these approaches can improve motor function and alleviate spasticity to some extent, significant challenges persist, including wide variations in treatment efficacy, pronounced side effects, and difficulties in long-term rehabilitation. Traditional Chinese medicine categorizes this condition under terms such as “five delays,” “five rigidities,” “spasm syndrome,” “muscle spasm,” and “atrophy syndrome” [4]. It posits that the pathological location is in the brain, involving the liver, kidneys, and spleen. The underlying pathology is characterized by a deficiency at the root and an excess at the branch—with liver-kidney deficiency and spleen-kidney insufficiency as the root, and phlegm-stasis obstructing the collaterals and tightness of tendons and vessels as the branch. Treatment emphasizes methods such as tonifying the kidneys and replenishing essence, softening the liver and relaxing tendons, strengthening the spleen and transforming phlegm, and invigorating blood and unblocking collaterals. It comprehensively employs acupuncture, massage, internal and external administration of Chinese herbal medicine, and qigong exercises, synergizing with modern rehabilitation techniques to offer distinct advantages. This paper systematically reviews ancient and modern literature, integrating contemporary clinical research to comprehensively summarize the etiology, core pathogenesis, and common pattern differentiation of spastic cerebral palsy in Traditional Chinese Medicine. It focuses on core therapeutic principles—tonifying the kidneys and replenishing essence, soothing the liver and relaxing tendons, strengthening the spleen and invigorating qi, promoting blood circulation and resolving stasis, resolving phlegm and unblocking collaterals, pacifying liver wind, and relieving spasms. It systematically elucidates the clinical application patterns, therapeutic characteristics, and synergistic advantages with modern rehabilitation of comprehensive interventions including acupuncture, tuina massage, internal herbal medicine, external herbal treatments, and traditional guided exercises. Simultaneously, it objectively analyzes current challenges in TCM interventions for spastic cerebral palsy, including inconsistent pattern differentiation, insufficient mechanism research, incomplete objective evaluation systems, scarcity of high-quality clinical studies, and inadequate standardized implementation. It further outlines future development directions: multidisciplinary integration, objective assessment, precise pattern differentiation, collaborative TCM-Western medicine rehabilitation, and home-based appropriate technologies. This paper aims to provide a systematic, comprehensive, actionable, and scalable theoretical framework and practical approach for TCM clinical rehabilitation of spastic cerebral palsy. It offers scientific reference for advancing related clinical and basic research, while providing theoretical support for enhancing rehabilitation outcomes in pediatric cerebral palsy, improving patients' quality of life, and alleviating the burden on families and society.*

**Keywords:** Spastic cerebral palsy, Traditional Chinese Medicine pathogenesis, Deficiency of liver and kidney, Phlegm-stasis obstructing collaterals, Liver-soothing and tendon-relaxing, Traditional Chinese Medicine rehabilitation, Acupuncture, Tuina.

## 1. Introduction

Cerebral palsy (CP) refers to a persistent syndrome of motor development and postural control disorders caused by non-progressive brain damage in fetuses or infants before the brain matures. This damage results from various causes during fetal or early childhood development. CP is often accompanied by multiple associated impairments, including varying degrees of intellectual disability, seizures, sensory abnormalities, language communication difficulties, behavioral issues, and secondary musculoskeletal deformities [5]. In recent years, advancements in perinatal medicine, neonatal intensive care, and critical care capabilities have significantly improved survival rates for preterm infants, extremely low birth weight infants, infants with severe asphyxia, and those with hypoxic-ischemic encephalopathy. However, the overall incidence of cerebral palsy has not shown a marked decline, remaining stable globally at 1.5% to 4%. Similar trends are observed in pediatric neurodevelopmental disorder screening data from certain

regions in China, confirming cerebral palsy as one of the primary causes of childhood limb disability and motor function impairment.

Spastic cerebral palsy (SCP) represents the most clinically prevalent, pathologically characteristic, and rehabilitation-focused subtype of cerebral palsy. Its primary pathological alterations concentrate in motor control-related structures including the cerebral cortex, subcortical white matter, internal capsule, brainstem, and spinal cord. The core pathophysiological mechanisms involve weakened descending inhibitory pathways following upper motor neuron damage, abnormally heightened excitability of anterior horn motor neurons in the spinal cord, and hyperactive stretch reflexes. Clinically, this manifests as markedly elevated muscle tone, active or hyperactive tendon reflexes, positive ankle clonus, possible positive Babinski sign, scissoring gait, equinus deformity, hip adduction, knee flexion, limited range of motion, diminished voluntary motor control, and impaired balance and coordination [6]. If

spasticity remains uncontrolled over the long term, it can lead to secondary muscle fibrosis, tendon contractures, osteoarticular deformities, scoliosis, hip dislocation, localized pain, stagnation or regression in motor development. This severely impacts the child's ability to perform activities of daily living, social participation, and lifelong quality of life, while also imposing a persistent and heavy burden on family caregiving and societal healthcare resources.

Modern medical clinical rehabilitation strategies for spastic cerebral palsy have adopted a multidisciplinary collaborative model. Primary interventions include physical therapy, occupational therapy, speech therapy, physical agent therapy, sensory integration training, pharmacotherapy, local botulinum toxin A injections, selective dorsal rhizotomy (SDR), various orthopedic surgeries, and postoperative rehabilitation training [7]. While these approaches demonstrate efficacy in improving motor function, alleviating spasticity, and correcting deformities, long-term clinical application reveals several limitations: Oral muscle relaxants exhibit pronounced systemic effects, limiting pediatric tolerance and safety, botulinum toxin therapy provides short-term relief requiring repeated injections, with some children developing antibodies and diminished efficacy, Surgical interventions involve significant trauma, strict indications, elevated perioperative risks, and prolonged postoperative rehabilitation periods. High-intensity exercise training demands high patient compliance and presents challenges for long-term adherence. For children with severe generalized spasticity, multiple system disorders, frail constitution, or poor long-term rehabilitation outcomes, the overall efficacy of existing intervention systems remains significantly underdeveloped. Therefore, exploring safe, gentle, long-lasting, low-risk, and suitable complementary or alternative therapies for sustained long-term intervention that can synergize effectively with modern rehabilitation has become a critical research direction in pediatric rehabilitation.

Traditional Chinese Medicine (TCM) possesses a comprehensive theoretical framework, extensive practical experience, diverse intervention methods, outstanding safety, and good compliance in diagnosing and treating childhood developmental disorders, limb contractures, motor delays, and conditions involving inadequate nourishment of tendons and meridians. It offers unique advantages in regulating overall functional status, alleviating muscle spasticity, improving qi and blood circulation, nourishing tendons and meridians, promoting development, and reducing secondary damage. Although ancient Chinese medical texts do not use the modern medical term "cerebral palsy," they provide highly detailed descriptions of core symptoms such as delayed standing, delayed walking, delayed teething, delayed speech, delayed hair growth, flaccidity of the head and neck, weak hands, weak feet, flaccid muscles, weak mouth, stiffness of the neck and back, stiff hands and feet, rigid muscles, constricted tendons and vessels, limb rigidity, and impaired flexion and extension. Theories on etiology, pathogenesis, pattern differentiation, treatment methods, and herbal/acupuncture applications are scattered throughout historical medical texts, laying a solid theoretical foundation for subsequent generations to understand and intervene in this condition. In modern times, practitioners in pediatric TCM, acupuncture, and rehabilitation medicine have built upon

classical theories while integrating contemporary medical research. This has gradually formed a comprehensive rehabilitation system centered on zang-fu organ differentiation, qi-blood-body fluid differentiation, and meridian differentiation. Key interventions include acupuncture, tuina massage, herbal medicine, external herbal applications, traditional qigong exercises, and emotional and dietary regulation. Extensive clinical observations and basic research indicate that TCM interventions can effectively reduce muscle tone, alleviate spasticity, increase joint range of motion, enhance muscle strength and motor control, and improve overall developmental levels. These interventions are associated with fewer adverse reactions, are suitable for long-term use, are convenient for home-based implementation, and demonstrate high synergistic potential with modern rehabilitation methods.

Currently, research on TCM interventions for spastic cerebral palsy continues to grow, yet several prominent issues persist: The theoretical framework lacks systematic completeness, there is no industry-wide standard for syndrome differentiation and classification, clinical studies often have small sample sizes, research design quality varies significantly, efficacy evaluation primarily relies on subjective indicators, objective and quantitative assessment systems remain underdeveloped, mechanism-of-action research is insufficiently in-depth, the path for integrating TCM with Western medicine is unclear, and standardized implementation protocols are lacking. Against this backdrop, this paper draws upon classical TCM theories, integrating modern authoritative guidelines, core journal literature, and clinical practice experience. It systematically reviews and elaborates on the etiology, core pathogenesis, pattern differentiation principles, therapeutic principles and methods, comprehensive rehabilitation protocols, synergistic advantages, existing challenges, and future development directions. This study aims to establish a logically coherent, comprehensive, evidence-based, and operationally feasible theoretical and practical framework. It seeks to provide scientific, rigorous, and practical reference guidelines for clinical rehabilitation, research design, educational training, and the promotion of appropriate technologies.

## 2. Classification of Traditional Chinese Medicine Disease Names and Understanding of Ancient Literature

### 2.1 Classification of Traditional Chinese Medicine Disease Names

Spastic cerebral palsy presents with complex and diverse clinical manifestations, characterized primarily by significantly delayed motor development, limb spasticity and rigidity, abnormal posture, tight tendons and muscles, increased muscle tone, and limited joint mobility. It is frequently accompanied by multi-system functional impairments affecting cognition, language, perception, behavior, skeletal structure, and musculature. Based on primary symptoms, pathogenesis, and traditional disease classification, Traditional Chinese Medicine primarily categorizes it into the following syndromes, which can be clinically referenced and applied comprehensively:

(1) Five Delays: encompassing delayed standing, walking, teething, speech, and hair growth. This primarily corresponds to the multifaceted developmental delays observed in children with spastic cerebral palsy, including motor, skeletal, linguistic, and pilomotor functions. The core pathogenesis emphasizes congenital deficiency, qi and blood insufficiency, and liver-kidney essence depletion, highlighting the disease essence of “developmental impairment and growth retardation”.

(2) Five Softnesses: Head/neck flaccidity, oral flaccidity, hand flaccidity, foot flaccidity, and muscular flaccidity. primarily describing the child’s inability to hold up the head and neck, weak lips, difficulty swallowing, inability to grasp with hands, inability to stand on feet, and flaccid muscle weakness. This is commonly seen in spastic cerebral palsy complicated by low muscle tone, physical weakness, and long-term disuse of functions. The core pathogenesis is closely related to spleen-stomach deficiency, insufficient qi and blood production, and inadequate nourishment of muscles and tendons.

(3) Five Stiffnesses: Refers to stiffness in the head and neck, hands, feet, muscles, and mouth. Core manifestations include limb rigidity, constriction, stiffness, impaired flexion/extension, markedly elevated muscle tone, and significant resistance to passive movement. This closely aligns with the most typical and core clinical features of spastic cerebral palsy, making it the TCM syndrome name most closely matching the primary characteristics of this condition. Its pathogenesis is often associated with yang deficiency, cold stagnation causing blood stasis, tendon-meridian constriction, and phlegm-stasis obstructing collaterals [8].

(4) Spasm Syndrome, Tendon Spasm, Contracture: Characterized by tight tendons and meridians, rigid limbs, spasms and convulsions, inability to flex or extend, and abnormally elevated muscle tone. This directly corresponds to the pathophysiological manifestations of the modern medical term “spastic state.” The pathogenesis emphasizes inadequate nourishment of tendons and meridians, obstruction of meridians, internal movement of wind pathogens, and impaired qi and blood circulation, providing a highly concise summary of the core symptoms of this condition [9].

(5) Atrophy Syndrome, Wasting Syndrome: Characterized by limb weakness, muscle wasting, loss of motor function, and inability to stand or walk. This term is frequently applied to describe advanced spastic cerebral palsy cases involving prolonged immobilization, severe muscle disuse, and profound functional impairment, highlighting pathological features of muscle malnutrition and functional disuse.

In clinical practice, spastic cerebral palsy often concurrently exhibits multiple features including developmental delays (“five delays”), muscle weakness (“five softnesses”), and spastic rigidity (“five hardnesses”). Therefore, “five hardnesses” and “spasticity,” and ‘contracture’ as the core diagnostic labels, while also considering the pathogenesis and clinical manifestations of the “five delays” and “five softnesses.” This approach better aligns with the complex nature of this disease, characterized by a mixture of deficiency

and excess patterns and involvement of multiple systems.

## 2.2 Theoretical Origins in Ancient Literature

The Huangdi Neijing systematically established the intrinsic connections between zang-fu organs, meridians, qi and blood, tendons and vessels, marrow reservoirs, and motor functions, limb movements, and postural control. This provided the fundamental theoretical basis for subsequent generations to understand spastic cerebral palsy-related conditions. The Suwen: Discussion on Atrophy explicitly states that “the liver governs the tendons,” “the spleen governs the muscles,” and “the kidneys govern the bones and produce marrow.” It emphasizes that limb movement, tendon flexibility, muscular strength, and skeletal firmness all depend on the coordinated functions of the liver, spleen, and kidneys, as well as the nourishment of qi, blood, body fluids, and essence. The Kidney governs bones and produces marrow.” This indicates that limb movement, tendon flexibility, muscular strength, and skeletal integrity all depend on the coordinated functions of the liver, spleen, and kidney, as well as the nourishment of qi, blood, body fluids, and essence. This establishes the core theoretical foundation for treating movement disorders and tendon contractions from an organ-based perspective. The Ling Shu: Treatise on the Sea emphasizes that “the brain is the sea of marrow,” clarifying that the fullness of cerebral marrow directly influences consciousness, perception, movement, balance, and other functions—a concept highly consistent with modern medicine’s understanding of the brain’s regulation of motor functions.

Qian Yi’s Direct Decisions on Pediatric Medicinal Syndromes from the Song Dynasty proposed that children exhibit physiological characteristics of “fragile viscera, prone to deficiency and excess, prone to cold and heat.” He emphasized that deficiency of kidney essence and weakness of the spleen and stomach are the fundamental causes of developmental disorders in children. He created classic formulas such as Liuwei Dihuang Pill, centered on the core therapeutic principle of tonifying the kidneys, replenishing essence, nourishing yin, and enriching marrow. These formulas became representative prescriptions for treating cerebral palsy in later generations of Chinese medicine, exerting a profound and enduring influence.

During the Ming Dynasty, Wan Quan’s “Elucidation of Pediatrics” stressed that “most childhood illnesses originate from fetal qi.” It systematically discussed the relationship between factors like fetal weakness, fetal toxins, birth injuries, external pathogens, and improper feeding with symptoms such as limb stiffness, impaired movement, and developmental delays. The text proposed a comprehensive treatment approach involving tonifying spleen earth, benefiting kidney essence, nourishing liver blood, unblocking meridians, and resolving phlegm and stasis. It emphasized harmonizing both congenital and acquired factors while addressing both symptoms and root causes. In the Qing Dynasty, Wu Qian’s Essentials of Pediatric Principles from The Golden Mirror of Medical Orthodoxy systematically categorized the “Five Delays, Five Softnesses, and Five Stiffnesses,” clarifying their etiology, symptoms, tongue-pulse manifestations, treatment principles, and formulae. He proposed that the Five Stiffnesses primarily

result from Yang deficiency, cold stagnation causing blood stasis, and rigid tendons and vessels. The Five Delays and Five Softnesses were attributed to congenital kidney deficiency, acquired spleen deficiency, and insufficiency of qi and blood. This formed a comprehensive theoretical system with well-defined principles, methods, formulas, and drugs, demonstrating strong clinical applicability. It stands as the definitive work in ancient Chinese pediatric medicine for diagnosing and treating this condition.

Although ancient physicians did not establish modern medical concepts such as brain injury, motor conduction pathways, or muscle tone regulation, their systematic understanding of childhood movement disorders, spasticity, and developmental delays from macro perspectives—including fetal constitution, zang-fu organs, qi and blood, meridians, tendons and vessels, exogenous pathogens, and internal injuries. This systemic understanding of childhood movement disorders, spasticity, and developmental delays exhibits high intrinsic consistency with modern theories on neurodevelopment, brain plasticity, motor control, and muscle spasticity. It provides a profound theoretical foundation and rich practical experience for modern standardized, scientific, and systematic interventions in spastic cerebral palsy through traditional Chinese medicine.

### 3. Etiology of Spastic Cerebral Palsy in Traditional Chinese Medicine

The etiology of spastic cerebral palsy is complex, involving multiple overlapping factors. It can be broadly summarized as follows: congenital constitutional deficiency serves as the fundamental basis, while intrapartum injury, inadequate postnatal nourishment, invasion by exogenous pathogens, and internal accumulation of phlegm and blood stasis act as significant precipitating and aggravating factors [10]. The interplay of internal and external pathogenic factors, the coexistence of deficiency and excess patterns, and the protracted nature of the disease ultimately form a complex pathomechanism.

#### 3.1 Insufficient Innate Constitution

The kidneys are the foundation of innate constitution, governing the storage of essence, the formation of bones and marrow, and connecting upward to the brain—the sea of marrow. Insufficient innate constitution is the most fundamental cause underlying the onset and progression of spastic cerebral palsy, directly determining the child's constitutional foundation and susceptibility to the condition.

(1) Parent Constitutional Deficiency: Insufficient parental kidney essence, deficiency of qi and blood, advanced maternal age at conception, prolonged illness leading to physical weakness, or excessive fatigue can all result in a weak fetal constitution. This manifests as deficient kidney essence, an empty sea of marrow, inadequate nourishment of the brain spirit, and insufficient lubrication of tendons and vessels after birth.

(2) Prenatal Dysregulation and Fetal Deficiency: During pregnancy, maternal emotional extremes, excessive fatigue, dietary indiscretion, consumption of raw/cold foods, untreated chronic illness, inappropriate medication,

falls/trauma, or exposure to external pathogens can damage fetal qi, disrupt qi and blood harmony, and impair fetal nourishment. This results in incomplete development of fetal organs, particularly manifesting as insufficiency in liver, kidney, spleen, and stomach functions.

(3) Internal accumulation of fetal toxins: Maternal internal accumulation of damp-heat, heat toxins, stasis toxins, or phlegm-dampness transmitted to the fetus can cause dysfunction of fetal organs, obstruction of cerebral collaterals, and disharmony of tendons and vessels. This lays the pathological foundation for postnatal spasticity, rigidity, and developmental delay.

#### 3.2 Perinatal Trauma and Asphyxia

Perinatal factors constitute significant acquired triggers for spastic cerebral palsy, often acting as acute pathogenic agents. They directly induce qi and blood disorders, cerebral stasis, and damage to the vital spirit, serving as the primary cause in numerous clinical cases [11].

(1) Difficult Labor and Birth Trauma: Abnormal fetal position, cephalopelvic disproportion, prolonged labor, and improper delivery assistance can cause compression, traction, or rotational injury to the fetal cranium. This leads to intracranial hemorrhage, cerebral contusion and laceration, and qi and blood stasis.

(2) Neonatal Asphyxia and Hypoxia-Ischemia: Umbilical cord entanglement, placental abruption, meconium-stained amniotic fluid, intrauterine distress, or postnatal asphyxia cause cerebral hypoxia-ischemia, qi dysfunction, cerebral vessel obstruction, loss of mental clarity, and impaired regulation of tendons and vessels [12]. This manifests as rigidity, tonic spasms, convulsions, and loss of motor control.

Traditional Chinese medicine posits that these factors represent sudden damage, abrupt disruption of qi and blood, obstruction of cerebral vessels, and loss of mental function. Though acquired, they directly impair the brain's vital energy and meridians, resulting in acute onset, severe symptoms, and pronounced spasticity. Thus, they constitute a major cause of spastic cerebral palsy in clinical practice.

#### 3.3 Postnatal Malnutrition and Exogenous Pathogenic Invasion

(1) Spleen-Stomach Deficiency and Qi-Blood Insufficiency: Postnatal malnutrition, improper feeding, picky eating, vomiting and diarrhea, prolonged illness leading to physical weakness, etc., result in spleen-stomach deficiency and qi-blood insufficiency.

(1) Spleen-Stomach Deficiency and Qi-Blood Insufficiency: Postnatal factors such as improper lactation, inadequate feeding, selective eating, vomiting, diarrhea, or prolonged illness leading to spleen-stomach deficiency result in insufficient sources for the generation of qi and blood. This failure to nourish muscles, tendons, and brain marrow not only exacerbates developmental delay but also causes tendon dryness and persistent spasms.

(2) External Pathogenic Factors and Tendons/Vessels Constriction: Invasion by wind, cold, dampness, heat, and other external pathogens can lodge in meridians, accumulate in joints, and obstruct qi and blood circulation. Cold induces contraction, dampness causes stickiness, and wind promotes movement—all exacerbating tendon/vessel constriction, stiffness, and spasm. Cold stimulation particularly intensifies lower limb spasms.

(3) Prolonged Illness Depleting Vital Qi: Conditions such as severe neonatal infections, pathological jaundice, severe malnutrition, anemia, and recurrent epilepsy persistently deplete qi, blood, yin, and yang. This exacerbates organ deficiency and tendon-meridian damage, prolonging the disease course and hindering functional recovery.

### 3.4 Internal Generation of Phlegm-Turbidity and Blood Stasis

Spastic cerebral palsy features a protracted course, chronic resistance to cure, and a complex interplay of deficiency and excess. It readily generates phlegm-turbidity and blood stasis on a foundation of underlying deficiency, forming a vicious cycle of “deficiency leading to excess, excess aggravating deficiency, mutual entanglement of deficiency and excess, and chronic disease invading the collaterals.” This represents a key pathological mechanism underpinning the intractable spasticity and difficulty in functional recovery.

(1) Qi Deficiency and Blood Stasis: Deficiency in the zang-fu organs leads to insufficient qi to propel blood circulation. Sluggish blood flow stagnates and forms stasis. When blood stasis obstructs cerebral vessels, it disrupts mental functions. When it blocks the meridians of the limbs, qi and blood fail to reach the extremities, causing inadequate nourishment of tendons and vessels. This results in stiffness, rigidity, pain, discomfort, and movement disorders [13].

(2) Spleen deficiency generating phlegm: Spleen-stomach weakness fails to transform water-dampness, disrupting fluid metabolism. Accumulated dampness transforms into phlegm. When phlegm-turbidity obscures the clear orifices, it causes diminished intellect, sluggish responses, and impaired consciousness. When phlegm-turbidity obstructs the meridians, it leads to heavy limbs, stiffness, spasm, impaired flexion/extension, and numbness.

(3) Mutual Entanglement of Phlegm and Stasis: Phlegm-turbidity and blood stasis mutually entangle, deeply lodging within cerebral collaterals, meridians, tendons, and joints. This viscous, deeply rooted obstruction causes highly intractable spasms, extreme limb rigidity, joint contractures, and severe functional limitations, rendering conventional interventions largely ineffective. Spleen-stomach deficiency due to malnutrition, vomiting, diarrhea, or prolonged illness leads to inadequate qi and blood production. This results in insufficient nourishment of muscles, tendons, and brain marrow, exacerbating developmental delays while causing tendon dryness and persistent spasticity.

## 4. Core Pathogenesis of Spastic Cerebral Palsy

The pathogenesis of spastic cerebral palsy is complex, with its

overall characteristics highly summarized as follows: the disease location is in the brain, involving the liver, kidney, and spleen, it presents with underlying deficiency and superficial excess, a mixture of deficiency and excess, deficiency is the root, while phlegm, stasis, wind, cold, and rigidity manifest as superficial symptoms, prolonged illness invades the collaterals, with tendons and vessels losing nourishment as the ultimate common pathway[14].

### 4.1 Underlying Deficiency: Liver-Kidney Deficiency, Insufficient Marrow Sea, Spleen-Kidney Dual Deficiency

#### 4.1.1 Kidney Essence Deficiency, Empty Marrow Sea

The Kidneys store essence, essence generates marrow, marrow communicates with the brain, and the brain is the Marrow Sea. Adequate kidney essence fills the marrow sea, nourishes brain spirit, ensures coordinated movement, normal posture, and healthy development. Deficiency of kidney essence empties the marrow sea, deprives brain spirit of nourishment, disrupts the governing spirit, and impairs movement regulation. This manifests as delayed standing, walking, and speech, intellectual impairment, limb incontinence, abnormal posture, and balance disorders—the fundamental pathogenesis of spastic cerebral palsy.

#### 4.1.2 Insufficient Liver Blood Deprives Tendons and Vessels of Nourishment

The liver governs tendons, stores blood, regulates free flow, and controls movement coordination. Tendons and vessels rely on ample nourishment from liver blood to maintain flexibility, smooth extension, free flexion and extension, and normal muscle tone. Deficiency of liver blood leads to inadequate nourishment of tendons and vessels, causing them to become constricted, stiff, spastic, and difficult to flex or extend, with increased muscle tone. This is the direct core pathogenesis responsible for the onset, persistence, and worsening of spasticity, and it is also the key pathological feature that distinguishes this condition from other types of cerebral palsy.

#### 4.1.3 Spleen-Stomach Deficiency: Insufficient Source for Qi and Blood Generation.

The spleen is the foundation of acquired constitution and the source of qi and blood generation. It governs muscles and limbs, transforming and transporting the essence of food and drink to nourish the innate constitution, lubricate muscles and tendons, and ascend to nourish the brain marrow. When the spleen and stomach are deficient, qi and blood production becomes inadequate, leading to muscle atrophy and weakness, inability to lift the limbs, and flaccidity of the head and neck. Simultaneously, qi and blood fail to ascend to nourish the brain or permeate the tendons and vessels externally, further exacerbating the depletion of the marrow sea and the constriction of tendons and vessels. This forms the core pathogenic pattern of mutual influence and combined deficiency between the spleen and kidney, representing the interaction between acquired and congenital factors.

### 4.2 Manifestation of Excess: Phlegm-Stasis Obstructing Collaterals, Wind Pathogen Stirring Internally, Cold

## **Congestion in Tendons and Vessels, Stiffness and Constriction of Tendons and Vessels**

### **4.2.1 Blood Stasis Obstructing Collaterals, Impeding Qi and Blood Circulation**

Birth trauma, asphyxia, qi deficiency, qi stagnation, and chronic disease invading collaterals can all lead to blood stasis. When blood stasis obstructs cerebral vessels, it disrupts mental functions and impairs motor regulation, when obstructing the meridians of the limbs, it impedes the circulation of qi and blood to the extremities, leading to malnourished tendons and vessels, stiffness and rigidity, restricted joint mobility, and pain or discomfort. This forms a crucial pathological basis for stubborn spasms, protracted disease course, and difficult functional recovery.

### **4.2.2 Phlegm-Dampness Internally Generated, Obstructing Orifices and Collaterals**

Spleen deficiency with excessive dampness and abnormal fluid metabolism lead to the internal generation of phlegm-dampness. Phlegm-dampness possesses viscous, heavy, obstructive, and pervasive properties. When it obscures the clear orifices, it causes mental confusion, diminished intellect, sluggish responses, and abnormal behavior. When it obstructs the meridians, it leads to heaviness, stiffness, spasm, impaired flexion/extension, numbness, and functional impairment in the limbs. This contributes to the disease's protracted course, recurrent exacerbations, and difficulty in achieving complete resolution.

### **4.2.3 Internal Movement of Wind Pathogen Causes Muscle and Vessel Constriction**

Liver and kidney yin deficiency, where yin fails to restrain yang, generates internal deficient wind, alternatively, external wind pathogen may trigger internal wind. Wind is characterized by mobility, rapid change, and instability. When wind pathogen disturbs the brain spirit and tendons/vessels, it causes limb spasms, paroxysmal exacerbations, abnormal postures, involuntary movements, fluctuating muscle tone, startle responses, convulsions, and restless sleep. This represents a key pathogenesis for fluctuating spasms and paroxysmal intensification.

### **4.2.4 Cold Congestion in Tendons/Vessels Causing Contraction and Rigidity**

Children possess immature yang qi, and those with constitutional deficiencies are particularly susceptible to cold pathogens. Cold induces contraction, stagnation, and pain. When cold pathogens invade tendons, meridians, and joints, it causes tendon contraction, stiffness, rigidity, impaired flexion/extension, cold pain, and worsening spasticity. Typical manifestations include lower limb spasticity, equinus deformity, and adductor muscle tension.

## **4.3 Pathogenesis Summary**

Spastic cerebral palsy primarily affects the brain while involving the liver, kidney, and spleen. Tendons and vessels

serve as the ultimate functional targets and pathological focal points.

### **Core Deficiency Manifestations:**

Kidney essence deficiency, insufficiency of marrow sea, liver blood deficiency, spleen-stomach weakness, and inadequate qi-blood generation.

### **Core Excess Manifestations:**

Blood stasis obstruction, internal phlegm-turbidity production, internal wind pathogen activity, cold stagnation in tendons and vessels, tendon-vessel constriction, and meridian obstruction.

These six factors—deficiency, stasis, phlegm, wind, cold, and spasm—interact, mutually reinforce, and exacerbate each other. This creates a complex, stubborn, and persistent pattern of pathogenesis: deficiency leads to excess, excess worsens deficiency, deficiency and excess coexist, chronic disease invades the collaterals, and tendons and vessels become malnourished. Ultimately, this results in a series of typical clinical manifestations: limb spasms, abnormal posture, delayed motor development, and functional impairment [15].

## **5. Common Differentiation Patterns in Traditional Chinese Medicine**

Based on authoritative domestic literature, clinical guidelines, and practice, spastic cerebral palsy commonly presents in four differentiation patterns. While each pattern may occur independently, they frequently coexist, dynamically transform, and involve both deficiency and excess manifestations. Clinical diagnosis requires flexible differentiation [16].

### **5.1 Liver-Kidney Deficiency Pattern**

**Primary Manifestations:** Significant delays in motor, language, and cognitive development, sitting, standing, walking, and speech skills lagging markedly behind peers, limb spasticity, rigidity, restricted flexion/extension, taut tendons and vessels, increased muscle tone, Weakness and fatigue in the lower back and knees, delayed closure of the fontanelle, delayed tooth eruption, red or pale tongue with little or no coating, thin and weak or deep and thin pulse, pale red fingerprints.

**Core Pathogenesis:** Insufficiency of kidney essence, deficiency of liver blood, depletion of the marrow sea, and inadequate nourishment of tendons and vessels.

**Treatment Principle:** Tonify the kidneys and replenish essence, nourish the liver and soften tendons, strengthen bones and muscles, facilitate joint function, and alleviate stiffness.

### **5.2 Spleen-Kidney Deficiency Pattern**

**Primary Symptoms:** Muscular atrophy and weakness, limpness of head, neck, lips, hands, and feet, inability to hold objects, stand, or walk, sallow or pale complexion, poor appetite, loose stools, emaciation, fatigue, reluctance to move, shortness of breath, and reluctance to speak, Limb spasms

accompanied by marked muscle weakness, pale tongue with thin white or slippery coating, weak, fine pulse, pale fingerprints.

**Core Pathogenesis:** Congenital deficiency of kidney essence combined with acquired spleen-stomach weakness, resulting in insufficient qi and blood production and inadequate nourishment of muscles and tendons.

**Treatment Principle:** Strengthen the spleen and tonify qi, replenish kidney essence, fortify muscles and bones, nourish tendons and vessels, support vital energy.

### 5.3 Phlegm-Stasis Obstructing Collaterals Pattern

**Primary Symptoms:** Severe limb rigidity, stiffness, and spasm with markedly restricted flexion/extension, passive movement encounters extreme resistance, joint contractures and deformities with severely impaired motor function, nearly complete loss of voluntary movement, Dull complexion, dark purple lips, and skin with a scaly texture, dark tongue with ecchymoses or petechiae, white greasy or yellow greasy coating, (thready), slippery, or deep (thready) pulse, purple and stagnant fingerprints, deep and stagnant.

**Core Pathogenesis:** Phlegm-turbidity and blood stasis mutually entangle, deeply burrowing into the brain orifices, meridians, and tendons. Qi and blood become obstructed and stagnant, leading to prolonged malnutrition of tendons and vessels.

**Treatment Principle:** Promote blood circulation and resolve stasis, transform phlegm and open orifices, unblock meridians and activate collaterals, soften hardness and relieve spasms, clear stagnation and unblock obstructions.

### 5.4 Liver Excess with Tendon Rigidity / Yin Deficiency with Wind Movement Pattern

**Primary Symptoms:** Significant limb spasm, markedly increased muscle tone, rigid and uncomfortable, difficult passive movement, irritability and anger, restless sleep, easily startled, night crying, limb twitching, dry mouth and throat, palmar and plantar heat, tidal fever and night sweats, red tongue with little or no coating and scant fluid, string-like or fine-rapid pulse, purple and fine fingerprints.

**Core Pathogenesis:** Insufficient liver yin fails to nourish tendons and vessels, yin deficiency generates internal heat, stirring up wind within, resulting in tendon constriction and spasm.

**Treatment Principle:** Nourish yin and soften the liver, pacify the liver and extinguish wind, relieve tension and resolve spasm, relax tendons and unblock collaterals, calm the mind and soothe the spirit.

## 6. Comprehensive Traditional Chinese Medicine Rehabilitation Interventions

### 6.1 Acupuncture Therapy

Acupuncture is the most evidence-based, widely applied, and

clinically effective core intervention in TCM for spastic cerebral palsy. It exerts multifaceted effects including awakening the mind and opening orifices, unblocking meridians, harmonizing qi and blood, balancing yin and yang, softening tendons and relieving spasms, regulating muscle tone, and improving motor function. Safe, minimally invasive, and well-tolerated, it can be integrated throughout the entire rehabilitation process.

**Treatment Principles:** Awaken the mind and open the orifices, nourish the liver and kidneys, strengthen the spleen and boost qi, unblock meridians, soften tendons and relieve spasms, harmonize qi and blood.

**Commonly Used Acupoints:** Head points (Baihui, Sishencong, Shenting, motor areas, foot motor-sensory areas) to awaken the mind and open orifices, regulating the central nervous system[17], Back-shu points (Ganshu, Pishu, Shenshu, Diaoshu) to regulate and tonify zang-fu organs, benefit qi and nourish blood, Limb points (Jianyu, Quchi, Shousanli, Waiguan, Hegu, Huantiao, Biguan, Fengshi, Weizhong, Yanglingquan, Zusanli, Sanyinjiao, Taichong, Taixi, Chengshan, Kunlun) to unblock meridians, relieve spasms, and improve mobility, Specialized spasm-relieving points (Yanglingquan as the meeting point of tendons, Taichong as the source of the liver, Jinsuo, Chengshan, Sanyinjiao) specifically target and alleviate tendon and meridian constriction.

**Common needling techniques:** Scalp acupuncture, body acupuncture, electroacupuncture, moxibustion, Jin San Zhen (Three Needles Technique), and other specialized methods, selected flexibly based on age, constitution, and spasm severity.

### 6.2 Tuina Therapy

Tuina is an essential foundational intervention for spastic cerebral palsy. Non-invasive, pain-free, and highly compliant with children, it is suitable for long-term home application. Core functions include rapidly reducing muscle tone, relieving muscle spasms, releasing muscle and tendon adhesions, expanding joint range of motion, improving local blood circulation, unblocking meridians, harmonizing qi and blood, nourishing tendons and vessels, and improving movement patterns [18].

**Core Principles:**

Relax to resolve spasticity, Unblock to treat contractures, Nourish tendons through softness, Restore function through movement, Apply gentle, sustained pressure, Progress sequentially. Common Techniques: Kneading, pressing, pushing, grasping, plucking, shaking, manipulating, stretching, rubbing, shaking, spinal.

**Key Intervention Areas:** For lower limb spasms, focus on relaxing the triceps surae, hamstrings, hip adductors, and quadriceps, for upper limb spasms, target the biceps brachii, pronator teres, wrist flexors, and finger flexors. Simultaneously emphasize conditioning core muscle groups (lumbar-dorsal, abdominal, and hip-surrounding muscles) to enhance overall postural control.

Syndrome Differentiation Massage: Liver-Kidney Deficiency: Emphasize tonifying Kidney and nourishing Liver, knead Kidney Shu and Liver Shu points, press Taixi and Sanyinjiao points. Spleen Deficiency: Focus on tonifying Spleen meridian, abdominal massage, spinal, knead Zusanli point. Phlegm-Stasis Obstructing Collaterals: Prioritize flicking and pulling meridians, press stagnant areas, promote blood circulation and resolve stasis, soften hardness and relieve spasms.

### 6.3 Oral Chinese Herbal Medicine

Characterized by syndrome differentiation, holistic regulation, and addressing both symptoms and root causes, long-term, regular use of Chinese herbs can improve organ function, reduce spasm recurrence, promote overall development, enhance rehabilitation tolerance, and decrease complications [19].

Liver-Kidney Deficiency Pattern: Modified formulas such as Liuwei Dihuang Wan, Zuogui Wan, Huqian Wan, or Bushenshenhuang Wan. Herbs include Rehmannia glutinosa, Cornus officinalis, Dioscorea opposita, Lycium barbarum, Cuscuta chinensis, Eucommia ulmoides, Achyranthes bidentata, Carapax testudinis, Angelica sinensis, and Paeonia lactiflora to tonify kidney essence, nourish liver, and soften tendons.

Spleen-Kidney Deficiency Pattern: Modified Bu Zhong Yi Qi Tang, Shen Ling Bai Zhu San, or Gui Pi Tang. Herbs include Astragalus, Codonopsis, Atractylodes, Poria, Chinese Yam, Tangerine Peel, Angelica, and Fried Licorice to fortify the spleen, boost qi, nourish the kidneys, and strengthen bones.

Phlegm-Stasis Obstructing Collaterals Pattern: Modified Bu Yang Huan Wu Tang, combined with Tao Hong Si Wu Tang and Er Chen Tang. Herbs include Astragalus, Angelica, Ligusticum, Paeonia rubra, Prunus persica, Carthamus, Lumbricus, Pinellia, Citrus peel, Poria, and Pinellia ternata processed with bile to activate blood circulation, resolve stasis, transform phlegm, and unblock collaterals.

Liver-Strengthening and Tendon-Tightening/Yin-Deficiency Wind-Movement Pattern: Modified formulas such as Shaoyao Gancao Tang, Yiguan Jian, and Zhengan Xifeng Tang. Emphasize heavy doses of white peony root (Bai Shao) and licorice root (Gan Cao) as the core pair for relieving spasms and relaxing tension. Combine with papaya (Mu Gua), tendon-stretching herb (Shenjin Cao), chicken-blood vine (Ji Xue Teng), kudzu root (Ge Gen), Uncaria hook (Gou Teng), and gastrodia tuber (Tian Ma) to soften the liver, relax tendons, and pacify liver wind [26, 29].

### 6.4 External Application of Chinese Herbs

Suitable for severe localized spasms, joint stiffness, difficulty taking oral medications, or infants/children unable to cooperate with oral treatments.

Chinese Medicinal Steam Bath/Foot Soak: Ingredients such as Stretching Tendons Herb, Bone-Penetrating Herb, Safflower, Mugwort Leaf, Devil's Claw, Mulberry Branch, Cinnamon Twig, Processed Sichuan Aconite, Processed

Grass Aconite, and Chicken Blood Vine are used to warm meridians, dispel cold, activate blood circulation, unblock collaterals, soften tendons, relieve spasms, and alleviate lower limb spasms.

Herbal Hot Compresses & Paraffin Therapy with Herbal Medication: Improve local blood circulation, relieve muscle tension, reduce pain, and increase joint range of motion.

Acupoint Plasters: Apply spasm-relieving, meridian-unblocking, kidney-tonifying, and spleen-strengthening medications to acupoints like Shenshu (BL23), Ganshu (BL18), Zusanli (ST36), and Yanglingquan (GB34) for sustained, gentle stimulation and efficacy.

### 6.5 Traditional Guided Exercises, Qigong, and Emotional/Dietary Regulation

Traditional guided exercises and qigong: Pediatric spine, abdominal massage, health-preserving massage, simplified Yijin Jing, Baduanjin, Wuqinxi, and TCM posture correction training. Nourish tendons through movement, guide qi through exercise, direct form with intention, and restore normal movement patterns.

Emotional Regulation: Calming the mind and soothing the spirit, pacifying the liver and extinguishing wind. This reduces irritability, crying, and fright that may trigger or worsen spasms, while improving sleep quality.

Dietary Regulation: Strengthening the spleen and harmonizing the stomach, tonifying qi and blood, nourishing the liver and kidneys. Avoid raw, cold, greasy, and spicy foods that harm the spleen and stomach. Ensure balanced nutrition to promote physical recovery.

## 7. Synergistic Advantages of Integrating Traditional Chinese Medicine Rehabilitation with Modern Rehabilitation

(1) TCM Rapidly Relieves Spasms, Modern Rehabilitation Training Becomes More Feasible: Acupuncture and massage can swiftly reduce muscle tone and increase joint range of motion, creating favorable conditions for exercise training, posture correction, and balance training, significantly enhancing the efficiency of modern rehabilitation.

(2) Modern rehabilitation corrects abnormal movement patterns, while TCM consolidates therapeutic effects and reduces recurrence: Modern rehabilitation focuses on movement patterns, functional training, and neuroplasticity remodeling. TCM emphasizes holistic regulation, visceral function, qi-blood-meridian balance, and tendon-vessel nourishment [20]. Their complementary nature creates synergistic therapeutic effects, minimizing functional regression.

(3) TCM Holistically Regulates Constitution to Enhance Rehabilitation Tolerance and Long-Term Outcomes: Improving digestion, sleep, immunity, emotional state, and physical constitution reduces complications while increasing patient compliance and rehabilitation continuity.

(4) TCM Offers High Safety, Low Risk, and Suitability for Long-Term Intervention: With no significant adverse reactions, it is suitable for infants, young children, those with weak constitutions, and patients requiring long-term rehabilitation, facilitating home-based and community-based implementation.

## 8. Conclusion

Spastic cerebral palsy falls under the categories of “Five Stiffnesses,” “Muscle Spasm,” “Contracture,” and “Five Weaknesses” in traditional Chinese medicine. Its core pathogenesis involves deficiency of liver and kidney essence, insufficiency of marrow sea, and weakness of spleen and stomach as the “Five Delays,” and “Five Softnesses.” Its core pathogenesis involves fundamental deficiencies in liver and kidney essence, insufficiency of the marrow sea, and weakness of the spleen and stomach. Manifestations include phlegm-stasis obstructing collaterals, internal wind disturbance, cold stagnation in tendons and vessels, and tendon-vessel constriction. The primary site of disease is the brain, with key factors being dysfunction of the liver, kidney, and spleen organs, inadequate nourishment of tendons and vessels, and obstruction of meridians. TCM rehabilitation centers on holistic principles, syndrome differentiation, addressing both root and branch causes, and harmonizing innate and acquired factors. It employs acupuncture, tuina massage, herbal medicine, external herbal applications, traditional qigong exercises, and emotional/dietary regulation. This comprehensive approach effectively alleviates limb spasticity, reduces muscle tone, increases joint range of motion, improves motor development, enhances muscle strength, and boosts activities of daily living. It offers distinct advantages including high safety, good compliance, low risk, suitability for long-term intervention, and strong synergy with modern rehabilitation.

Current TCM interventions for spastic cerebral palsy have evolved from traditional empirical medicine toward a new phase characterized by standardization, objectivity, scientific rigor, multidisciplinary integration, and collaborative TCM-Western medicine approaches. Future efforts should focus on strengthening theoretical frameworks, standardizing diagnostic criteria, refining objective evaluation methods, deepening mechanism research, optimizing clinical pathways, and promoting appropriate technologies. This will foster a more precise, efficient, systematic, replicable, and scalable comprehensive rehabilitation model. Such advancements will provide a more robust, scientific, and reliable theoretical and practical foundation for elevating rehabilitation standards for spastic cerebral palsy in China, improving children’s quality of life, and alleviating the burden on families and society.

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