Advances in Research of Traditional Mongolian Medicine for Cervical Spondylotic Radiculopathy

Mei SHUANG[1], Galiba[2], Wentong BAI[2], Sarula WANG[2]

1. Department of Acupuncture and Tuina, Inner Mongolia International Mongolian Hospital, Hohhot 010020, China; 2. Graduate School of Inner Mongolia Medical University, Hohhot 010020, China

Abstract Traditional Mongolian Medicine (TMM) therapies have emerged as a prominent therapeutic option for Cervical Spondylotic Radiculopathy (CSR), owing to their demonstrated efficacy, cost-effectiveness, and high clinical accessibility. This study systematically reviews classical Mongolian medical texts to synthesize CSR-related knowledge, including disease profiles, pathogenesis, and therapeutic strategies—through dual analytical perspectives from modern medicine and TMM theory. Furthermore, it critically evaluates recent clinical research on TMM interventions for CSR, encompassing manual therapies, herbal formulations, and holistic regimens. The integrated analysis aims to provide references for optimizing TMM clinical practices in CSR treatment.

Key words Cervical Spondylotic Radiculopathy (CSR), Traditional Mongolian Medicine (TMM), Research on traditional Mongolian medical therapies, Silver needle acupuncture, Cupping and bloodletting therapy

1 Introduction

Cervical Spondylotic Radiculopathy (CSR), a common clinical condition and frequently occurring disease, refers to a certain degree of pain, numbness, sensory loss, and reflex changes in the innervated area, and it is caused by cervical degeneration and compression of nerve roots[1]. Its symptoms mainly manifest as neck stiffness, limited mobility, and upper limb numbness and soreness[2]. In traditional Mongolian medicine (TMM), CSR occurs when the movement of Heyi element (Mongolian medical concept) is obstructed, Xila element (Mongolian medical concept) becomes predominant, and pathological blood gathers, thereby affecting the normal circulation of upper limb white veins and resulting in clinical symptoms such as neck and shoulder stiffness, pain, upper limb numbness, and restricted neck movement. According to the World Health Organization (WHO) list of the world's top ten chronic refractory diseases, cervical spondylosis ranks second. The global number of cervical spondylosis patients has reached 900 million. As the most common clinical manifestation of cervical spondylosis, CSR accounts for approximately 60% of cervical spondylosis cases[3]. With the widespread use of electronic products, changes in work patterns, and imbalances in dietary environments, the incidence of CSR is increasing annually[4], showing a trend of younger onset. It not only causes physiological dysfunction but also exacerbates psychological burdens, severely affecting people's physical and mental health and quality of life. This article primarily studies the etiology, pathogenesis, and treatment methods of CSR from the perspective of TMM, aiming to provide references for accurate diagnosis and effective treatment of CSR.

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Mei SHUANG, doctoral degree, chief physician.

2 Understanding of CSR in TMM

2.1 Understanding of CSR in TMM ancient books In TMM ancient books, the concept of CSR was not explicitly defined, but it can be categorized under TMM white vein disease based on its clinical symptoms and pathogenic mechanisms, also known as Huyang disease. *The Four Medical Tantras*[5] records: "The main causes of Huyang disease are external force injuries leading to traumatic heat or conflict heat, toxic heat entering veins, and obstruction of qi and blood circulation caused by external force pressure accumulating in collaterals. When combined with injury heat or Xila heat, it becomes heat-type Huyang disease; when combined with Badagan, it becomes cold-type Huyang disease". *The Four Parts of Nectar*[6] states: "White vein disease is caused by internal disturbances from external injuries leading to heat accumulation in white veins or convergence of Xila element, thereby causing conflict of Heyi element that disrupts white vein circulation, which can be divided into heat-type and cold-type". The *Zhe Dui Ning Nuo Er*[7] notes: "Overexertion or external force disturbances may induce conflict of Heyi element, resulting in stiffness from behind the ears to the neck and back, numbness of the thumb and ring finger, and other typical symptoms". *The Sea of Medical Methods*[8] documents: "Damage to limb white veins may manifest as reduced tactile perception, limb flexion, rigid contracture, swelling pain, and restricted movement". *The TMM Internal Medicine*[9] states: "White vein disease primarily arises from obstruction of qi and blood circulation descending into white veins, thereby forming white vein disease."

2.2 Etiological mechanism According to the TMM theory, the cervical spondylosis falls under the category of white vein disease. And it arises due to factors such as overexertion, falls or contusions, damage to neck tendons, prolonged exposure to damp-cold, sudden cold and humid climate, or external influences dis-

rupting the "separation process of essence and waste". These factors cause an imbalance of the Three Roots and Seven Elements, with predominance of Heyi and Badagan. Heyi, blood, and Xila element conflict and stagnate in the neck, leading to impaired blood circulation, accumulation in neck tendon veins and upper limb white veins, obstruction of qi and blood flow, local muscle spasms, and poor blood circulation. This results in clinical symptoms such as neck stiffness and pain, restricted movement, neck-shoulder pain, upper limb weakness, and numbness[10-12].

2.3 Treatment methods TMM therapies employ external treatment methods such as acupuncture, warm needle, cupping and bloodletting, moxibustion, and Nuohulahu therapy, combined with Mongolian medicine syndrome differentiation and treatment to achieve holistic regulation, harmonizing body elements, balancing the Three Roots and Seven Elements, relaxing tendons and activating collaterals, unblocking white veins, promoting qi and blood circulation, and alleviating pain.

2.3.1 Internal treatment methods. (i) Traditional Mongolian medicinal therapies. *The Zhe Dui Ning Nuor*[7] records that Garidi-13 demonstrates significant efficacy in treating white vein disease. If accompanied by upper limb weakness, Inula Four-Ingredient Decoction is added, or if Heyi disorder occurs, Agarwood Seventeen-Ingredient Powder is administered. *The Diagnostic and Medicinal Dual Essentials*[13] states that Bezoar-25 is the preferred formula for white vein disease. For cold-type white vein disease, Three-Seed Decoction and Six Good Medicinals are prescribed orally. *The Four Medical Tantras*[5] mentions that oral borneol can converge dispersed injury heat, while long pepper and goat milk are added for cold-type Huyang disease. *The Sea of Medical Methods*[8] documents that formulas such as Sarga Ridi Seventeen-Ingredient Pill, Five Garuda Pill, and Wish-Fulfilling Jewel Pill all possess therapeutic effects for white vein disease.

(ii) Modern Mongolian medicinal therapies. Modern Mongolian medicinal therapies have demonstrated significant efficacy in multiple clinical studies. Research by Menghe Erdun *et al.*[11] showed that combining Mongolian medicine (Wulan-13 Decoction, Erdun Wurile, and Garidi-13 Pill) with cervical traction achieved an effective rate of 90.00%, superior to the Western medicine control group. Sunier *et al.*[14] applied a comprehensive protocol integrating acupuncture, tuina (Chinese therapeutic massage), and Mongolian medicine (Erdun Wurile, Garidi-15 Pill, and Naru-3 Pill), achieving a total effective rate of 94.82%. Aoqier *et al.*[15] found that Sawurile alone had an effective rate of 88.23%, which increased to 91.66% when combined with TMM acupuncture. Burigude *et al.*[16] reported that a multimodal Mongolian medicine regimen (Five-Ingredient Qingzhuo Pill, Erdun Wurile, and Naru-3 Pill combined with acupuncture) achieved an efficacy rate of 90.91%, significantly outperforming the Western medicine control group's 69.70%. These studies suggest that Mongolian medicinal therapies, whether used alone or combined with traditional methods like acupuncture and tuina, exhibit advantages in treating various diseases. Their distinct features include timed administration (different formulas taken in the morning, noon, and evening) and the use of guide herbs (*e.g.*, Zhuanglun-5 Decoction or taken with mutton bone soup). However, future research needs to further standardize sample sizes, randomization methods, and efficacy evaluation criteria.

2.3.2 External treatment methods. (i) Therapies in ancient books. TMM ancient texts document that treatment methods such as TMM acupuncture, cupping and bloodletting, Manna therapy, hot compress, and moxibustion can effectively alleviate CSR pain and numbness symptoms. *The Four Medical Tantras*[5] states that fire cupping above the scapula can clear "Xieri Wusu", while recommending Five-Ingredient Manna Medicinal Bath or natural hot spring therapy to warm and unblock meridians. *The Four Parts of Nectar*[6] records that for finger soreness caused by white vein disease, musk goat dung stir-fried with white liquor can be applied externally to the neck and shoulders. The Eighteen Branches of Medical Classics[17] proposes using deer dung boiled in wine as a hot compress on "Juhe Sanmen" (a specific body region) and the area above the first vertebral joint along the hairline. *The Medical Moon Emperor*[18] additionally recommends moxibustion at acupoints using golden hairpin herb or tinder herb to treat "neck stiffness."

(ii) Modern therapeutic techniques. Modern therapeutic techniques include TMM acupuncture therapy, TMM silver needle warm needle therapy, cupping and bloodletting therapy, external application therapy, and tuina therapy. Compared to the independently applied therapies in ancient texts, these methods are now often combined to enhance efficacy. Among them, TMM silver needle warm needle therapy and TMM cupping and bloodletting therapy are currently the primary traditional techniques for treating CSR.

(iii) TMM acupuncture therapy. TMM acupuncture therapy is a characteristic therapeutic technique that uses golden or silver needles to stimulate or conduct cold/heat effects at specific acupoints on the human body to treat diseases. It boasts a long historical heritage and unique clinical efficacy[19]. The *Blue Beryl*[20] defines it as a "therapy for correcting errors of the five therapeutic techniques," highlighting its therapeutic value. Through mechanisms such as suppressing Heyi, enhancing stomach fire, promoting digestion, dissipating accumulations, and improving muscle numbness and swelling[12], this therapy effectively regulates qi and blood circulation, unblocks meridians, and balances the relationship between Qisu and Heyi. In treating conditions like shoulder, neck, lumbar, leg pain, and gout, TMM follows the principle of "treating cold with heat" by using acupuncture to enhance qi and blood circulation in the affected areas, unblock meridians, and achieve clinical effects such as relaxing tendons and activating collaterals, dispelling cold, and alleviating pain[19].

(iv) TMM silver needle warm needle therapy. As a distinctive traditional therapy, TMM silver needle warm needle therapy involves inserting specially crafted silver needles into specific acupoints and heating the needle handles to deliver dual stimulation

through acupuncture and warmth. It exhibits multiple therapeutic mechanisms: promoting qi and blood circulation, anti-inflammatory and analgesic effects, relaxing tendons and dispelling cold, releasing adhesions, as well as balancing the "Heyi, Xila, Badagan" (Three Roots) and drying up "Xila element"[21-22]. Clinical studies demonstrate that this therapy shows significant advantages over conventional acupuncture in improving Heyi element circulation, regulating Badagan-Heyi disorders, enhancing immunity, eliminating inflammation, and drying "yellow fluid" (pathological exudate). Ye Rigui[23] combined Mongolian medicine (Tonglaga-5, Wish-Fulfilling Jewel Pill, *etc.*) with warm needle therapy, achieving a total effective rate of 98.84% in the observation group, significantly higher than the 90.48% in the Western medicine control group. Tala *et al.*[24] found that under treatment at the same acupoints (*e.g.*, Huzhunai acupoint, Xila acupoint), the warm needle group achieved a 90% effective rate, markedly surpassing the 76.7% of the conventional acupuncture group. These studies consistently indicate that TMM silver needle warm needle therapy not only effectively alleviates CSR symptoms but also exhibits safety, reliability, and durable efficacy, making it a distinctive therapy worthy of clinical promotion.

(v) TMM cupping and bloodletting therapy. TMM cupping and bloodletting therapy is a distinctive external treatment technique that combines the thermal effects of cupping with bloodletting, demonstrating significant advantages in CSR treatment through the dual mechanisms of action: negative pressure suction and detoxification and stasis removal. This therapy utilizes the mechanical stimulation and thermal effects generated by cupping, combined with the pathogen-expelling function of bloodletting, to rapidly improve local microcirculation, eliminate pathological products such as toxins, evil blood, and yellow fluid, and effectively achieve therapeutic goals including local decompression, elimination of non-bacterial inflammation, and promotion of nerve repair. Its mechanisms of action include directly acting on the lesion area through negative pressure suction to alleviate nerve root compression; improving qi and blood circulation and eliminating muscle spasms; regulating body fluid metabolism and promoting the excretion of pain-inducing substances. Multiple clinical studies confirm the exceptional efficacy of this therapy: Amuguleng[25] found that the observation group (cupping and bloodletting) achieved a total effective rate of 90.6%, significantly higher than the 69.7% in the acupuncture control group; Wang Surilagatu[27] conducted a controlled study on 144 patients, showing a total effective rate of 93.1% in the treatment group (cupping and bloodletting), markedly superior to the 77.8% in the acupuncture control group; Zhang Yurong[28] further demonstrated that when combined with cervical traction, the total effective rate of cupping and bloodletting therapy reached 92.3%, showing significant advantages over acupuncture alone (73.1%).

(vi) TMM topical application therapy. TMM topical application therapy is one of the distinctive external treatments in TMM, involving the preparation of single or multiple Mongolian medicinal powders into ointments, pills, cakes, or plasters using water, vinegar, alcohol, honey, or vegetable oil as excipients. These are directly applied to acupoints or affected areas to achieve dual therapeutic effects of acupoint stimulation and medicinal action. This therapy offers unique advantages: avoiding hepatic first-pass effects and gastrointestinal degradation, improving drug bioavailability, reducing systemic toxicity and side effects[29], flexible treatment duration, and good patient compliance. Clinical research by Zhang Yichi *et al.*[30] confirmed that using Huogitai Xiaotong Plaster (a Mongolian medicinal formula) for cervical spondylosis treatment, with acupoint combinations tailored to symptoms (*e.g.*, Fengchi and Jiaji acupoints for neck-shoulder symptoms, Quchi and Shousanli for upper limb symptoms), achieved a total marked effectiveness rate of 96.7% in the treatment group, surpassing the 93.3% in the acupuncture control group. This demonstrates the therapy's reliable efficacy and flexible application timing for cervical spondylosis.

(vii) TMM Tuina Therapy. Tuina techniques primarily loosen the soft tissues around the cervical spine and promote blood circulation, thereby alleviating tense or spasmodic, edematous muscle fibers and muscles, allowing effective absorption of non-bacterial inflammation[14]. Tuina therapy can relieve pain and swelling, unblock meridians and collaterals, moisten stiffness and relax tendons, resolve muscle spasms, improve qi and blood circulation, and unblock white veins[12]. It also regulates visceral qi and blood in the human body, ensures normal physiological functions, dredges meridians, activates qi and blood flow, stimulates nerve reflexes, and enhances the body's regulation of fluid circulation[31]. TMM tuina employs diverse techniques, including pushing, pinching, rolling, tapping, kneading, grasping, and pulling methods, tailored to the patient's specific condition[12].

3 Understanding of CSR in western Medicine

3.1 Overview of CSR CSR is a cervical degenerative disease characterized by compression of nerve roots due to cervical disc herniation, intervertebral foramen stenosis, facet joint hyperplasia, *etc.*, leading to radiating pain, numbness, and discomfort in corresponding segmental innervation zones[32]. The primary clinical manifestations include localized pain in the neck and shoulders, radiating pain and numbness in the upper limbs and fingers corresponding to the affected nerve segments, and in severe cases, muscle weakness and sensory disturbances in the upper limbs and fingers[33]. Imaging findings include: CT showing intervertebral foramen narrowing, cervical curvature deformation, and vertebral segment instability[34]; cervical X-ray revealing vertebral body hyperplasia, significant uncinate process hypertrophy, narrowed intervertebral spaces, and reduced intervertebral foramina[35]. Epidemiological surveys highlight its clinical significance: Wang Baojian *et al.*[36] analyzed data from a Grade 3A hospital orthopedics clinic in Beijing (2018-2020), showing that CSR accounted for the highest proportion (39.51%) among 38 512 cervical spondylosis cases. In particular, modern lifestyle shifts, such as pro-

longed desk work and excessive electronic device use, have led to a marked younger-onset trend in cervical spondylosis. A related study[37] of 4 896 children and adolescents aged 3 – 18 in Harbin reported a cervical abnormality detection rate as high as 22.90%.

3.2 Pathogenesis The exact pathogenesis of CSR is still not completely clear. At present, the generally accepted pathological mechanisms of CSR mainly include mechanical compression theory, cervical vertebra biomechanics imbalance theory, chemical radiculitis theory and autoimmune disorder theory[38].

3.2.1 Mechanical compression theory[39]. Mechanical compression primarily originates from degenerative changes in the cervical spine. When intervertebral instability occurs in the disc, it can lead to abnormal movement between adjacent vertebral bodies and alterations in the center of rotation. Vertebral bodies undergo compensatory hypertrophy due to increased and uneven stress distribution, resulting in bone hyperplasia at stress concentration points along the anterior and posterior margins. This process ultimately leads to mechanical compression of adjacent cervical nerve roots, which is considered the primary pathogenic factor.

3.2.2 Cervical biomechanical imbalance theory. The stability and physiological curvature of the cervical spine are maintained by soft tissues including muscles and ligaments. Biomechanical imbalance in the cervical region, such as muscular strength imbalance or structural abnormalities, can compromise cervical stability. When spinal force equilibrium is disrupted, this leads to dysfunction of intrinsic spinal balance. Consequently, extrinsic peripheral soft tissues compensate by intensifying contractile activity to counteract mechanical instability caused by vertebral misalignment[40].

3.2.3 Chemical radiculitis theory[40]. Multiple inflammatory mediators such as tumor necrosis factor-alpha (TNF-α) and interleukin-6 (IL-6) are found to accumulate at sites of herniated intervertebral discs and neural injuries. These inflammatory cytokines trigger local inflammatory responses, inducing neuronal hyperexcitability and nociceptive sensitization, ultimately manifesting as characteristic radicular pain.

3.2.4 Autoimmune dysregulation theory[41]. Studies have demonstrated significantly elevated IgG and IgM levels in both cerebrospinal fluid and serum of patients with herniated disc disease. Pathological specimens reveal deposits of antigen-antibody complexes within herniated disc material, accompanied by substantial infiltration of lymphocytes and macrophage activation. These immunological findings suggest a self-perpetuating cycle where immune response mechanisms are triggered, exacerbating intervertebral disc degeneration and contributing to the pathogenesis of radicular pain.

3.3 Treatment methods The treatment of CSR in modern medicine is mainly divided into non-surgical treatment and surgical treatment. At present, the treatment of CSR is mainly non-surgical treatment, including exercise and rest, cervical traction, manual therapy, drug therapy, steroid injection and so on. Surgical treatments mainly include anterior cervical decompression and fusion, cervical disc replacement, posterior cervical foraminal surgery and minimally invasive surgery[42]. According to the actual clinical signs and symptoms and examination of patients, the most important thing is to choose the appropriate treatment to relieve symptoms most quickly.

3.3.1 Non-surgical treatment. (i) Exercise therapy. This approach involves targeted exercises to improve cervical functional capacity, strengthen cervicodorsal muscular strength, and enhance spinal stability, thereby alleviating symptoms including pain, numbness, and stiffness. It plays a pivotal role in both prevention and rehabilitation of CSR. Additionally, external immobilization devices such as cervical collars and braces may be applied to restrict cervical motion, stabilize vertebral alignment, and promote muscle relaxation. However, prolonged reliance on cervical supports may induce muscular disuse atrophy and prove counterproductive to functional recovery.

(ii) Cervical traction. The stability and physiological curvature of the cervical spine require muscles, ligaments, and other soft tissues for fixation and maintenance. Traction therapy can increase the width of intervertebral spaces and intervertebral foramina, thereby reducing the internal pressure load on intervertebral discs and improving peripheral circulation[43].

(iii) Manipulation therapy. This therapy can relieve muscle tension, correct cervical facet joint dysfunction, and alleviate neck pain. Different techniques yield distinct therapeutic effects: massage and manipulation techniques effectively reduce muscle stiffness, while rotational-lift techniques significantly improve cervical range of motion[44]. Studies have demonstrated that adjusting spatial relationships among vertebral bodies, intervertebral discs, and cervical nerve roots can reduce nerve root compression and adhesions, thereby relieving CSR neuropathic symptoms[45].

(iv) Drug treatment. The primary symptom of CSR is radicular pain in the cervical, shoulder, and dorsal regions, for which drug treatment provides symptomatic treatment. Clinically employed medications include anti-inflammatory agents, neurotrophic drugs, analgesics, and vasodilators to alleviate pain, reduce nerve root edema, and achieve anti-inflammatory and analgesic effects[46]. Oral NSAIDs (non-steroidal anti-inflammatory drugs) such as Celecoxib and Meloxicam can mitigate musculoskeletal discomfort. For acute cases, intravenous mannitol achieves dehydration, while glucocorticoids are administered for severe pain relief. Neurotrophic agents are delivered via oral or acupoint injection, supplemented by cytokine modulators to suppress osteophyte proliferation[47].

3.3.2 Surgical treatment. Anterior cervical discectomy and fusion (ACDF) remains the gold standard surgical procedure for CSR patients with bilateral or multilevel nerve root compression unresponsive to conservative treatment[48]. Recent advancements in minimally invasive techniques for CSR primarily include percutaneous puncture techniques and microendoscopic procedures. Percutaneous techniques treat CSR by resecting or dissolving degenerated herniated discs, applicable only to CSR caused by mild

to moderate cervical disc herniation[49]. These methods effectively relieve clinical symptoms while demonstrating high safety, minimal invasiveness, precise decompression, minimal impact on tissue structures, and favorable prognosis. Clinical practice allows selection of specific surgical approaches based on patients' actual conditions and preferences. Despite procedural variations, all surgical interventions share the unified objective: reducing spinal cord/nerve root pressure, maintaining cervical stability, alleviating pain, and preventing deformities to achieve therapeutic outcomes[50].

4 Conclusions

In TMM theory, CSR arises from obstructed Heyi element flow, excessive Xila element accumulation, and pathogenic blood stasis, which disturb the upper limb's white veins, manifesting as neck-shoulder stiffness, upper limb numbness, and restricted cervical mobility. Modern medical approaches employing pharmacotherapy, traction, or surgery exhibit high recurrence rates and notable adverse effects. TMM, grounded in the "Three Roots-Seven Elements" theory, demonstrates unique advantages through combined external therapies and internal medications. Core external treatments focus on tendon relaxation, white veins clearance, qi-blood circulation promotion, and analgesia, with silver needle therapy and cupping bloodletting being particularly notable. Silver needle therapy employs specialized needles deeply inserted at acupoints like Dazhui and Jianjing as per "Three Roots" theory. Manipulations through lifting-thrusting and rotating techniques regulate the "Three Roots," stimulate injured nerve roots, while warm needle techniques enhance cold-dispelling and stasis-resolving effects. Cupping bloodletting first induces hyperemia via cupping at cervical Ashi points, followed by three-edged needle blood release to eliminate pathogenic blood and inflammatory mediators, achieving dual dampness-removing and toxin-purging effects with rapid microcirculation improvement. These external therapies directly target lesions, providing immediate analgesia and long-term regulatory balance. Characterized by safety, low recurrence, and embodying TMM's therapeutic principles of simplicity, efficacy, and cost-effectiveness, they represent quintessential TMM interventions.

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