Theoretical and Practical Research on Mongolian Medicine for the Treatment of Orthopedic Diseases

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Abstract. Mongolian medicine, as an important branch of traditional Chinese medicine, has developed a comprehensive system for the treatment of orthopedic diseases through its long history of clinical practice. Its core theories are the "Three Roots Theory," which explains the physiological functions and disease patterns of the human body, and the "Seven Elements Theory," which analyzes the body's material composition and metabolic mechanisms. Its practical features include manual reduction, pharmacological intervention, and traditional treatments. Based on the theoretical roots and practical logic of Mongolian orthopedics, this article systematically examines its theoretical foundation, treatment principles, core technologies, and clinical applications. Integrating modern research findings, this article provides an in-depth analysis of its unique therapeutic advantages in treating conditions such as closed fractures, joint disorders, and spinal lesions from multiple perspectives. By comprehensively elaborating on the clinical value of the Mongolian medical system, this article aims to provide new insights and practical references for the diversified treatment of orthopedic diseases, promote the integration and innovation of traditional and modern medicine, and offer orthopedic physicians and patients more personalized, innovative, and inclusive treatment options.

Keywords: Traditional Chinese Medicine; Mongolian Medicine; Orthopedic Diseases.

1. Introduction

Bone is an important supporting structure of the human body. With the passage of time, changes in lifestyle, and the influence of various other factors, orthopedic diseases have become a serious health challenge, putting people under great pressure. Even with timely diagnosis and treatment, successful surgery, and appropriate medication, it is often difficult to avoid varying degrees of functional impairment in certain parts of the body. Therefore, it is urgent to find an effective, long-lasting, and safe treatment method. Traditional Chinese medicine has always played a unique role in disease management. Traditional Chinese medicine emphasizes the concept of holistic thinking and focuses on balancing yin and yang and harmonizing qi and blood, providing a comprehensive management plan for orthopedic patients. For patients with orthopedic diseases, it is necessary to focus not only on the normalization of physiological parameters but also on the improvement of patients' cognition of the disease, psychological coping ability, and quality of life. Among them, the treatment mechanism of Mongolian medicine is gradually being scientifically verified, opening up a new path for the treatment of orthopedic diseases [1,2]. Mongolian medicine has a long history of more than 1,100 years. Mongolian medicine was created by the Mongolians based on their observation of nature and religious beliefs. Throughout its continuous development, Mongolian medicine has absorbed the essence of Tibetan medicine, Chinese medicine, Ayurveda, and other Eastern medical disciplines.

With its unique theories and connotations, Mongolian medicine continues to evolve and progress, occupying a pivotal position within traditional medicine.This article provides an overview of research on the treatment of orthopedic diseases in Mongolian medicine, aiming to provide a theoretical basis and practical reference for the inheritance and development of Mongolian orthopedics, and for its greater role in the prevention and treatment of bone injuries and diseases in the modern era.

2. Theoretical Foundations of Mongolian Orthopedics

The theoretical framework of Mongolian orthopedics is rooted in Mongolian medicine's holistic understanding of human life. Its core lies in the dynamic balance of the "Three Roots" and the "Seven Elements," as well as the close connection between bone physiology and pathology and systemic metabolism.

2.1. Core Theoretical System

2.1.1 Theory of the three roots

The "Three Roots"—Heyi, Xiri, and Badagan—form the core framework for Mongolian medicine's interpretation of human physiological functions and the development of disease. Hei possesses the properties of lightness, movement, astringency, and cooling, governing respiratory, circulatory, nervous, and motor functions; Xiri possesses the properties of heat, sharpness, lightness, and odor, regulating metabolism and body temperature balance; Bada Gan possesses the properties of heaviness, coldness, dullness, and softness, influencing digestion, absorption, and growth and development. These three elements are interdependent and constrained, maintaining a dynamic balance—when this balance is disrupted, illness can occur. For example, an overabundance of Hei can cause migratory joint pain, while an overabundance of Xiri can cause localized redness, swelling, heat, and pain. An overabundance of Bada Gan manifests as stiffness and heaviness in the joints.

2.1.2 Theory of the seven elements

The "Seven Elements" (also known as the Seven Elements) refer to the basic substances that make up the human body, including food essence, blood, muscle, fat, bone marrow, bone, and semen. They are the material foundation for maintaining life. The production and metabolism of the Seven Elements depend on the regulation of the "Three Roots," and the functions of the "Three Roots" in turn require the material support of the Seven Elements, forming a dynamic relationship where "qi governs form, and form carries qi." Among them, bones, as one of the seven elements, are not only the supporting structure of the body, but also the gathering area of "Heyi" Qi. Its growth state and function strength are directly determined by the strength of kidney Qi.

2.2. Bone Physiology and Pathological Mechanism

Mongolian medicine theory believes that bone metabolism is closely related to the function of the whole body. After the gastrointestinal tract digests and absorbs food, it is refined and balanced by the five internal organs, and affects bone metabolism through the process of "clear and turbid secretion" - the clear part of the bone becomes bone marrow, and the dregs become hair, nails, and teeth; the clear part of fat can nourish the bones, and the turbid part becomes joint lubricant and sweat [3]. This "clear and turbid metabolism" is the core of the human body's vital energy biochemical system. Once it is disordered, it will lead to bone malnutrition or accumulation of pathological products, causing orthopedic diseases. Modern research has confirmed that Mongolian medicine's understanding of bone metabolism has something in common with modern physiology. A study on the "clear and turbid theory" of Mongolian medicine in 2022 found that the "gastrointestinal-bone" metabolic axis described in it is highly correlated with the "intestinal flora-bone metabolism" pathway in modern medicine, providing evidence for the scientific nature of Mongolian medicine theory [4].

3. Mongolian Orthopedic Treatment System and Principles

Mongolian orthopedic treatment takes "holistic adjustment and following the trend" as its core idea, forming a unique treatment principle and practice logic.

3.1. Holistic View and Syndrome Differentiation and Treatment

Mongolian medicine emphasizes that orthopedic diseases are not local isolated lesions, but the result of imbalance of the "three roots" of the whole body and local damage. Treatment requires

comprehensive judgment of the cause of the disease through four examinations: observation, questioning, palpation, and pulse diagnosis: observation observes the complexion, morphology, and tongue coating; questioning understands the medical history, symptoms, and living habits; palpation senses the temperature, tenderness, and swelling of the affected area; and pulse diagnosis judges the state of the "three roots" through pulse rhythm. For example, fracture patients need not only reduction and fixation, but also judgment on whether there is Heyi disorder (lack of Qi and blood), Xiri excess (local inflammation) or Bada Gan accumulation (cold and dampness stagnation): Heyi type: pain wandering, accompanied by fatigue and floating pulse, requiring Heyi harmonization and replenishing Qi and blood; Xiri type: local redness, swelling and burning, accompanied by thirst and rapid pulse, requiring clearing heat and cooling blood, reducing swelling and relieving pain; Bada Gan type: joint stiffness and heaviness, aggravated by dampness, requiring dispersing cold and dampness, warming the meridians and unblocking the collaterals [5]. This "differential diagnosis and treatment" thinking coincides with the "individualized treatment" concept of modern precision medicine.

3.2. Natural Therapy and Minimally Invasive Concept

Mongolian medicine advocates "stimulating the body's self-healing ability with minimal intervention" and emphasizes reducing invasive operations. Its theoretical basis is that the human body has a natural repair mechanism, and excessive surgery will destroy the vital energy biochemical system and hinder the metabolism of clear and turbid substances. For example, willow or fir splints are used in fracture treatment rather than metal internal fixation. These natural materials have suitable elasticity, maintaining stability while avoiding compression of blood vessels and nerves. Combined with herbal topical application, they can accelerate healing [6,7].

4. Main Treatment Methods

Mongolian orthopedic treatment is based on "manual reduction as the core, drug intervention as an auxiliary, and traditional treatment as a supplement," forming a diversified technical system. It is mainly used for closed fractures (such as humeral fractures and tibia and fibula fractures, especially suitable for children and elderly patients), joint diseases (joint dislocations, sacroiliac joint disorders, rheumatoid arthritis), and spinal diseases (cervical spondylosis, lumbar disc herniation, lumbar muscle strain), etc.

4.1. Manual Reduction and Splint Fixation

Mongolian bone setting is a hallmark technique of Mongolian orthopedics. It is based on the principle of "hand touch, heart understanding, and method from the hand", emphasizing "precise perception and gentle reduction". The bone setter uses the touch of his fingertips to judge the displacement direction, degree of overlap and whether there is rotation of the fracture ends, with an accuracy of up to millimeters; he uses techniques such as "stretching, straightening, lifting and rotating" to use the body's own weight and the doctor's skill to correct the dislocation and avoid violent pulling; and uses elastic materials such as willow and fir to make splints, which are shaped according to the body shape, and the tightness of the cloth straps is adjusted according to the principle of "loose is not firm, tight is injured", leaving space for joint movement. A biomechanical study in 2022 showed that the elastic modulus of Mongolian medicine willow splints (1.2-1.8GPa) is close to that of human cortical bone (1.5-2.0GPa), which can achieve "dynamic fixation" - maintaining fracture stability while allowing small movements and promoting callus growth [8]. A controlled study using Mongolian medicine manipulation to reduce and treat clavicle fractures found that compared with conventional care, Mongolian medicine can improve the recovery rate of shoulder joint function and patient satisfaction, thereby improving the quality of life of patients [9]. A controlled study in 2023 confirmed that the postoperative infection rate (1.2%) of Mongolian medical manipulation reduction + splint fixation for closed fractures was significantly lower than that of

surgical treatment (5.8%), and the patients' limb function recovery scores were higher, confirming the advantages of the minimally invasive concept [10].

Another clinical study used Mongolian medicine pelvic rotation reduction method to treat 50 patients with sacroiliac joint disorder: the patient lay on his back, and when the lesion was on the right side, the doctor fixed the posterior superior iliac spine with his left hand and pushed the right knee to the flexed knee and hip position with his right hand; the assistant fixed the contralateral ilium and the affected lower limb, and the doctor used the body's gravity to transmit force, passively adducting and abducting the hip joint until it snapped and reset; after the operation, the patient was asked to walk briskly for 3-5 minutes to stabilize the reset. The results showed that the total effective rate was 92%, and the recurrence rate was 8%, which was significantly better than the Western medicine physical therapy group (effective rate 78%, recurrence rate 26%) [11].

In the early 20th century, the unique Mongolian alcohol-spraying osteopathic therapy was formed. This therapy is characterized by the use of liquor. It is the result of a systematic summary of the medical experience of predecessors and the integration of various excellent treatment techniques of shaman medicine. As a special treatment in Mongolian osteopathy, which has been listed as a national intangible cultural heritage, wine spray osteopathy is a comprehensive non-surgical treatment method. Its characteristics are that it takes into account the mental and physical conditions of patients with bone injuries, integrating biophysical therapy, physiological and psychological therapy, and qigong psychotherapy. It has significant characteristics and advantages such as closed, non-traumatic, and self-motivated, and has a definite clinical efficacy. A clinical study included 86 patients with knee osteoarthritis. They were divided into a control group and an experimental group according to the nursing method, with 43 cases in each group. The control group received routine care, while the experimental group received Mongolian medicine wine spray massage therapy as an auxiliary pain care. The results showed that after 4 weeks of intervention, the VAS score of the experimental group was significantly lower than that of the control group (1.12 vs. 3.11); in terms of the excellent rate of knee joint function, the experimental group (88.37%) was significantly higher than the control group (74.42%), indicating that Mongolian medicine spray wine massage therapy assisted pain care has a significant effect on improving the pain level of KOA patients, can promote knee joint recovery, and is worthy of promotion [12].

4.2. Drug therapy

Mongolian medicine treatment follows the principle of "external treatment of tendons and bones, internal regulation of qi and blood", and is divided into external application and internal administration.

4.2.1 External application medicine

With the core of promoting blood circulation and removing blood stasis, reducing swelling and relieving pain, the commonly used formula includes safflower-elderberry paste (30g safflower, 50g elderberry, 0.5g musk, and white wine mixed into paste), which is suitable for swelling and pain in the early stage of fracture. Modern research has confirmed that elderberry can play a bone-protective role by improving the microbiome [13]. Habuderen-9 (composed of 9 medicinal materials such as realgar, sulfur, and calamine) is particularly effective for joint swelling and pain in rheumatoid arthritis and gouty arthritis. In 2021, in vitro experiments showed that its extract can inhibit the expression of inflammatory factors IL-6 and TNF-α [14]. Qiwei Jiegu San (a plaster made of elderberry, red sandalwood, gypsum, etc.) can promote callus growth, with a total clinical efficacy of 89.7% [15]. A controlled study included 123 OA patients and randomly divided them into three groups (41 cases each): Mongolian medicine group (external application of Mongolian medicine ointment containing 12 medicinal materials such as radix strychnifolia and aconite), Tianhe Gutong plaster group (traditional Chinese medicine control), and glucosamine hydrochloride group (Western medicine control). After 28 days of treatment, the results showed that the VAS score of the Mongolian medicine group decreased significantly at 2 weeks, 4 weeks and follow-up ($P<0.05$), which was better than that of the control group; the WOMAC pain score improved more significantly ($P<0.05$),

especially in knee OA. At the same time, the study also found that Mongolian medicine can significantly reduce proinflammatory factors such as MMP-3, TNF-α, etc. [16].

4.2.2 Oral medication

According to the imbalance type of the "three roots", it includes Heyi type, Xiri type and Bada Gan type. Among them, the Bada Gan type includes Agari-35-flavor pills, which contain Terminalia chebula, cardamom, etc., to harmonize Heyi and nourish qi and blood; the Xiri type includes Yihe Wulan-13-flavor pills, which contain bezoar, gypsum, etc., to clear heat and cool blood; the Bada Gan type includes Renmandula-11-flavor pills, which contain cinnamon, dried ginger, etc., to dispel cold and remove dampness. The classic prescription "Garididi Wuwei Pill" (termbarbary fruit, musk, processed aconite, etc.) is often used for rheumatic bone pain. A clinical study in 2020 showed that its onset time for pain relief (2.3 days) was significantly shorter than that of ibuprofen (3.8 days) [17].

The Mongolian medicine Erwei Duzhong Decoction significantly improved rheumatoid arthritis (RA) and its concurrent osteoporosis (OP) in a collagen-induced arthritis (CIA) rat model. In vitro and in vivo experiments found that oral administration of TBD reduced arthritis symptoms in CIA rats (reduced arthritis score by 28.3%), joint destruction and systemic bone loss (increased bone mineral density (BMD) by 28.5%), and improved bone microstructure and biomechanical properties (increased trabecular bone number Tb.N by 41.7%). Mechanism verification showed that TBD reduced the expression of IL-17, MMP13 and p-JNK proteins in synovial tissue in vivo. This study revealed for the first time the dual effect of TBD in treating RA complicated with OP by regulating the IL-17/MAPK pathway through ICA, providing a new strategy for clinical development [18].

4.3. Traditional Auxiliary Treatments

4.3.1 Cupping and bloodletting therapy

Cupping: "Moving cupping" or "retaining cupping" is performed on the painful area to promote local blood circulation through negative pressure. It is suitable for lumbar muscle strain and cervical spondylosis. Previous studies have shown that cupping combined with acupuncture can effectively improve musculoskeletal pain [19].

Bloodletting: Bloodletting is performed by puncturing acupoints such as Dazhui and Weizhong to relieve heat and detoxify. It is suitable for acute arthritis and gout. Clinical observations in 2021 showed that bloodletting therapy can reduce the blood uric acid level of gout patients by 15%-20% within 24 hours [20].

4.3.2 Moxibustion and hot ironing

Moxibustion: Moxibustion on acupoints such as "Shenshu" and "Zusanli" warms the spleen and kidneys, strengthens the tendons and bones, and is suitable for osteoporosis. A recent meta-analysis of 28 RCTs showed that warm acupuncture can improve femoral neck ($MD = 0.07$, $p = 0.002$) and hip bone density ($SMD = 0.87$, $p < 0.001$), which is better than the control group [21]. Hot ironing: Use a heated salt bag or a "Zhuanglun Wutang" medicine bag to warm the affected area to dispel cold and dampness and relieve pain from lumbar disc herniation. A 2020 study confirmed that hot ironing can reduce the concentration of local inflammatory factors and relieve nerve compression symptoms [22]. In clinical practice, many orthopedic diseases are treated with a combination of various Mongolian medicines. For example, in a case report, a 45-year-old male patient suffered multiple pelvic fractures after falling from a height, accompanied by hemorrhagic shock (blood pressure 80/50 mmHg). Comprehensive treatment of Mongolian medicine was adopted: manual reduction + gauze external fixation to stabilize the fracture; acupoint holographic therapy (stimulating Neiguan and Yongquan) to regulate blood pressure; oral administration of Aoxigen-18 pills (to stop bleeding and calm the nerves) and Garidi-13 pills (to reduce swelling and relieve pain); external application of Habuderen-9 (knees) and Zhuanglunwutang (waist) with wax. After 4 months of treatment, the fracture healed well, shock symptoms were relieved, no complications such as deep vein thrombosis occurred, and the Barthel index (life self-care ability score) increased from 20 points to 85 points [23]. At the same time, Mongolian medicine is also very economical. According to the 2022 health

economic analysis, the average cost of Mongolian medicine for treating lumbar disc herniation is about 3,200 yuan, which is only 26.7% of surgical treatment (12,000 yuan) [24].

5. Conclusion

Mongolian orthopedic treatment, centered on the principle of "three-root balance," integrates manipulation, medication, and traditional healing techniques. It offers advantages in the treatment of orthopedic conditions: short treatment cycles, high safety, and low costs. It provides a viable option for patients who cannot tolerate surgery, reducing tissue adhesions, accelerating functional recovery, and achieving relatively low adverse reactions. However, with the rapid development of modern medicine, the application and development of Traditional Chinese Medicine (TCM) in the prevention and treatment of orthopedic conditions still faces numerous challenges, including the preservation of traditional Chinese medicine knowledge, its integration with modern medicine, and the promotion of its clinical applications. Therefore, establishing a TCM model for the prevention and treatment of orthopedic conditions and effectively inheriting and utilizing TCM resources are crucial for promoting the development of TCM and improving the prevention and treatment of orthopedic conditions. To further develop Mongolian medicine, three key areas of work must be prioritized. First, mechanistic research: identifying the molecular targets of active ingredients in Mongolian medicines (such as elderberry syringin) and elucidating the effects of manual reduction on local hemodynamics. Second, standardization: developing operational specifications for bone-setting manipulations and drug formulations to promote clinical homogeneity. Finally, integration of Chinese and Western medicine: exploring combined approaches of "Mongolian manipulation + modern rehabilitation" and "Mongolian medicine + targeted drugs" to complement each other's strengths. As a culmination of the wisdom of traditional Chinese medicine, Mongolian orthopedics, with its integration of the natural medical philosophy of "harmony between man and nature" and modern precision medicine, will undoubtedly contribute uniquely to the prevention and treatment of orthopedic diseases worldwide.

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