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Research Progress in Traditional Chinese Medicine Treatment of Rotator Cuff Injury

Xuehan Lu

Kaifeng 155 Hospital, Kaifeng 475000, Henan, China

Abstract: ***Rotator cuff injury is the most common cause of shoulder pain and dysfunction, with its incidence increasing with age. While modern medicine has made rapid progress in diagnosis (e.g., MRI) and surgical treatment (e.g., arthroscopy), it faces issues such as trauma, high costs, long postoperative recovery cycles, and suboptimal efficacy in some patients. Traditional Chinese Medicine (TCM), based on the theories of "Jin Shang" (musculotendinous injury) and "Bi Zheng" (arthralgia syndrome), utilizes comprehensive therapies including internal and external herbal medicine, acupuncture, moxibustion, tuina, and acupotomy. These methods demonstrate unique advantages in alleviating pain, improving function, and promoting tissue repair. This article systematically reviews the clinical research progress of TCM in treating rotator cuff injury in recent years, summarizing findings from the perspectives of etiology and pathogenesis understanding, internal and external herbal treatments, characteristic external therapies (such as herbal external application, fumigation/washing, acupotomy, and meridian-sinew tuina), and comprehensive treatment plans. The analysis indicates that TCM treatment possesses the characteristics of holistic regulation, strong individualization, high safety, and ease of promotion, showing significant advantages especially in mild-to-moderate injuries and the postoperative rehabilitation stage. This article aims to summarize the application of TCM for rotator cuff injury in the past five years, hoping to provide references for clinical practice and scientific research.***

Keywords: Rotator Cuff Injury, Jin Shang (Musculotendinous Injury), Traditional Chinese Medicine Treatment, Research Progress, Review.

1. Introduction

Rotator cuff injury is the most common cause of shoulder pain and dysfunction, accounting for over half of all shoulder disease diagnoses [1]. The rotator cuff is a tendinous complex formed by the tendons of the supraspinatus, infraspinatus, teres minor, and subscapularis muscles, crucial for maintaining shoulder joint stability and performing complex movements. Rotator cuff injuries include tendinitis, partial tears, and full-thickness tears, and have become the primary cause of shoulder pain. Epidemiological studies show that rotator cuff injury is more common in middle-aged and elderly individuals over 60, especially those engaged in heavy physical labor, with a higher incidence that gradually increases with age [2,3]. Its occurrence is closely related to age-related degeneration, trauma, overuse, and biomechanical abnormalities. Therefore, with the ongoing aging of the population, this disease has gradually become a significant social health issue.

Modern medical treatment for rotator cuff injury follows a stepped principle, ranging from conservative treatment (NSAIDs, physical therapy, corticosteroid injections) to surgical treatment (arthroscopic repair). While certain outcomes are achieved, long-term use of NSAIDs carries gastrointestinal and cardiovascular risks, hormone injections may accelerate tendon degeneration, surgical indications are relatively narrow, and there are issues such as high costs, postoperative trauma, joint stiffness, a certain incidence of complications, and re-tear rates [4,5]. Therefore, finding safe, effective conservative therapies that promote self-repair has become an important clinical topic.

In TCM, rotator cuff injury can be categorized under "Jin Shang" (musculotendinous injury), "Jian Bi" (shoulder arthralgia), or "Tong Bi" (painful arthralgia). Its fundamental pathogenesis lies in "Jin Shi Suo Yang" (musculotendinous structures losing nourishment), leading to pain due to "Bu Tong Ze Tong" (obstruction causing pain) and "Bu Rong Ze Tong" (malnourishment causing pain). TCM treatment of this disease, through both internal and external approaches, can significantly improve patients' shoulder pain and dysfunction, reduce surgical rates, and prevent recurrence, demonstrating unique advantages. This article aims to summarize relevant research from the past five years, outline progress, analyze shortcomings, and look to the future, hoping to provide references for clinical practice and scientific research.

2. TCM Understanding of the Etiology and Pathogenesis of Rotator Cuff Injury

TCM classifies rotator cuff injury under "Jin Shang" (musculotendinous injury), "Jian Bi" (shoulder arthralgia), or "Tong Bi" (painful arthralgia), considering its root cause as the decline of Zang-Fu organ function, deficiency of the Liver, Spleen, and Kidneys, leading to "Jin Shi Suo Yang" (musculotendinous structures losing nourishment), "Bu Tong Ze Tong" (obstruction causing pain), and "Bu Rong Ze Tong" (malnourishment causing pain). The occurrence of this disease results from the interaction of internal and external factors, with a particularly close relationship to the Liver, Spleen, and Kidneys.

2.1 External Factors

Rotator cuff injury is primarily attributed to "Lao Sun" (strain) and "Wai Shang" (trauma). Su Wen: Xuan Ming Wu Qi states: "Long-term looking damages blood; long-term lying damages Qi; long-term sitting damages flesh; long-term standing damages bone; long-term walking damages the sinews. These are the five kinds of damage caused by overexertion." Due to constitutional weakness or aging and physical debilitation, coupled with external contraction of Wind-Cold-Dampness pathogens, shoulder Cold congeals in the blood vessels,

leading to restricted flexion and extension. Alternatively, long-term repetitive excessive motion or physical labor leads to “Jiu Xing Lao Sun” (long-term walking causing strain) of the shoulder muscles and sinews, depleting Qi and Blood, and causing the sinews and vessels to lose their moisture. Under the accumulation of long-term micro-trauma, rotator cuff tendons suffer from tissue ischemia, hypoxia, structural disorder, and fragility. Improper exertion, acute falls, inappropriate exercise, or traction — “Wai Shang” (trauma) — can directly cause “Jin Duan” (sinew rupture), “Jin Fan” (sinew displacement), “Jin Zou” (sinew derangement), damage to the collaterals, extravasation of blood from the vessels, Qi-Blood stasis and stagnation, eventually forming painful swelling and stiffness, sinew and bone spasm, and inability to abduct the shoulder.

Modern TCM orthopedics experts further propose the “Jin Gu Shi Heng” (imbalance between sinews and bones) theory [6], considering that the shoulder joint’s “Jin” (rotator cuff tendons, ligaments) and “Gu” (humeral head, acromion, glenohumeral joint) are interdependent in structure and function. The structural characteristic of rotator cuff injury onset is “Jin Gu Shi Heng” (imbalance between sinews and bones), with the biomechanical feature being “Dong Li Shi Heng Wei Xian, Jing Li Shi Heng Wei Zhu” (dynamic imbalance occurring first, static imbalance being primary) [7]. Imbalances in the Jin-Gu equilibrium, such as narrowing of the subacromial space (bony factor) and instability of the humeral head (“Jin Bu Shu Gu”—sinews failing to restrain the bone), are key pathogenesis leading to shoulder impingement and rotator cuff injury. This provides a theoretical basis for manual adjustments of joint position and restoration of dynamic balance.

2.2 Internal Factors

Rotator cuff injury is a chronic degenerative disease, mostly occurring in middle-aged and elderly individuals. Its root lies in the decline of Zang-Fu organ function, deficiency of the Liver, Spleen, and Kidneys, with malnourishment of the sinews, bones, and channels. The core is “Gan Shen Kui Xu” (Liver-Kidney deficiency) and “Qi Xue Bu Zu” (Qi-Blood insufficiency). “The Liver governs the sinews; the Kidneys govern the bones.” After middle age, the Liver and Kidneys gradually decline. Insufficient Liver-Blood leads to malnourishment and fragility of the sinews; deficiency of Kidney-Essence leads to inadequately filled bone marrow and soft bones. Reduced movement of the shoulder muscles and bones, combined with Liver-Kidney deficiency failing to nourish the sinew vessels and bones, means even minor external force can cause injury. “The Spleen governs the muscles and four limbs” and is the source of Qi and Blood transformation. Spleen-Stomach weakness leads to insufficient transformation of Qi and Blood, causing the muscles and sinews to lose warmth and nourishment, becoming lax and weak, and prone to strain. Furthermore, after rotator cuff injury, sinew injury and vessel obstruction impede the smooth flow of Qi and Blood. Wind, Cold, and Dampness pathogens take advantage of the deficiency to invade the shoulder area. Combined with Kidney-Essence deficiency, Spleen failing in transportation, and Liver failing in free coursing, Qi-Blood stagnation is aggravated, forming a pathological combination of Phlegm and Stasis obstructing the channels and collaterals. This is an important factor causing shoulder joint stiffness and restricted movement, lingering pain, and worsening with cold.

3. Main Methods and Research Progress of TCM Treatment for Rotator Cuff Injury

3.1 Herbal Medicine Treatment

3.1.1 Internal Herbal Therapy

Herbal treatment for rotator cuff injury often emphasizes internal administration, highlighting treatment based on syndrome differentiation, formula selection, and combining internal and external treatment. Professor Shi [7] advocates approaching from three stages with dual regulation internally and externally: the acute stage focuses on moving Qi, activating Blood, resolving stasis, unblocking collaterals, nourishing and softening the sinews, using modified Sheng Yu Tang combined with Shen Tong Zhu Yu Tang; the subacute stage focuses on dispelling Phlegm, resolving stasis, strengthening sinews, and correcting bones, using modified Sheng Yu Tang combined with Niu Bang Zi Tang; the chronic stage focuses on supporting the healthy Qi and dispelling pathogens, relaxing sinews and bones, using modified Sheng Yu Tang combined with Du Huo Ji Sheng Tang, thereby restoring the harmony of Qi and Blood and the balance of sinews and bones. For patients with syndrome differentiation of Gan Shen Kui Xu (Liver-Kidney deficiency), herbs that supplement and benefit the Liver and Kidneys are often the first choice. Zou Mingming [8] used modified Du Huo Ji Sheng Tang to treat rotator cuff injury of the Liver-Kidney deficiency type. Since such patients often have a prolonged, lingering illness or lack active, systematic treatment, with external pathogens entering the interior and prolonged illness damaging the Kidneys (Kidneys govern storing Essence and generating marrow), the treatment focuses on supplementing and benefiting the Liver and Kidneys while also emphasizing dispelling pathogens. The formula uses Sangjisheng (Taxilli Herba) and Duzhong (Eucommiae Cortex) as the main herbs to supplement and benefit the Liver and Kidneys, assisted by Duhuo (Angelicae Pubescentis Radix), Fangfeng (Saposhnikoviae Radix), Xixin (Asari Radix et Rhizoma), and Qinjiao (Gentianae Macrophyllae Radix) to dispel Wind-Cold-Dampness pathogens between the sinews and bones, plus small amounts of Chuanxiong (Chuanxiong Rhizoma), Shengdihuang (Rehmanniae Radix), Baishao (Paeoniae Radix Alba), and Danggui (Angelicae Sinensis Radix) to activate Blood and nourish Blood. For rotator cuff injury patients with external contraction of Wind-Cold and Qi-Blood stagnation, clinical focus is on dispelling pathogens and activating Blood to resolve stasis. For the Qi stagnation and Blood stasis type, activating Blood to resolve stasis must be prioritized [9]. Chen Shiduo stated in Bian Zheng Lu: “If Blood is not activated, stasis cannot be removed; if stasis is not removed, bone cannot connect.” Therefore, treatment involves internal administration of Fu Yuan Huo Xue Tang or Xue Fu Zhu Yu Tang, etc., and external fumigation/washing with herbs that have the effect of activating Blood and resolving stasis.

3.1.2 External Herbal Therapy

TCM external treatment is based on traditional Chinese medical theory and employs methods of applying medicine externally, including herbal external application and herbal fumigation/steaming. These therapies have good efficacy in alleviating shoulder pain caused by rotator cuff injury and reduce adverse drug reactions compared to Western medical treatments [10,11].

Herbal external application typically uses herbs with effects like activating Blood to resolve stasis and unblocking channels and collaterals. These are prepared into powders, ointments, etc., and applied to the affected area or acupoints. The active components of the external herbal medicine and their solvents are absorbed through the epidermis and pores, overcoming the skin barrier composed of the stratum corneum, diffusing layer by layer, actively or passively diffusing into the systemic circulation, and penetrating into the local microcirculation to reach the lesion [12]. This reduces the secretion of inflammatory factors, clears local metabolic products, and achieves analgesic and anti-inflammatory effects [13]. Yang Jingyuan [14] and Wang Chunyan [15] respectively used Liu Sheng San and Zhan Jin Gao for external application on the shoulder joint area of rotator cuff injury patients. Assessment based on pain scores showed that patients' VAS scores significantly decreased, and shoulder pain was significantly relieved, indicating that external application of Chinese herbs on the shoulder joint surface can achieve anti-inflammatory and analgesic effects.

Herbal fumigation utilizes the warm thermal effect of herbal liquid steam on the affected area, helping to relax muscles, activate blood circulation, promote lymphatic return and blood circulation, accelerate metabolism, and reduce local swelling, pain, and stiffness [16,17]. Cheng Xia et al. [18] used Tou Hai San fumigation to treat patients after rotator cuff repair surgery, and Wang Tao et al. [19] used Hong Hua Hua Yu Tang for washing/fumigation in post-operative rotator cuff injury patients. Both study results showed that herbal fumigation/washing can achieve good analgesic effects. When combined with relevant exercise regimens, patients' shoulder joint function also significantly improved.

4. Acupuncture Treatment

4.1 Conventional Acupuncture Treatment

Acupuncture is a commonly used clinical treatment method and is also widely applied in treating rotator cuff injury. Through needle insertion combined with specific manipulations to stimulate acupoints, it unblocks the channels and collaterals, activates Blood to resolve stasis, moves Qi to relieve pain, achieving the effect of "treating internal diseases externally." Wai Ke Zheng Zhi Quan Shu mentions: "All pain is caused by Qi stagnation and Blood stasis leading to obstruction." Treatment typically selects acupoints from the shoulder, scapular region, and the three Yang channels of the hand, such as Jianjing (GB21), Jian San Zhen (shoulder three needles), Shousanli (LI10), Tianzong (SI11), and Ashi points. Yang Xiaoyong [20] used Jian San Zhen to treat rotator cuff injury. After achieving Deqi, lifting, thrusting, twisting, and rotating manipulations were performed to direct the needle tip to the shoulder joint space, penetrating along the direction of the rotator cuff muscle fibers until Deqi was achieved. Post-treatment VAS scores and shoulder function scores significantly improved compared to pre-treatment, indicating that Jian San Zhen can soothe the channels and unblock collaterals, relax sinews and relieve pain, achieving a relaxing effect on shoulder soft tissue spasms, thereby relieving local tissue edema and adhesion, promoting the absorption of inflammatory factors, and improving patients' symptoms. Additionally, rotator cuff injury treatment should be based on meridian differentiation according to its symptoms and specific location [21]. For patients with the Hand Yangming Meridian pattern, pain often manifests as anterior shoulder pain, worsening with active abduction. Clinically, pain predominantly on the lateral shoulder often indicates the Hand Shaoyang Meridian pattern. Patients with the Hand Taiyang Meridian pattern primarily experience posterior shoulder pain, worsening with adduction. Since the Hand Yangming and Hand Shaoyang meridians traverse the shoulder area, distal points like Hegu (LI4), Waiguan (TE5), and Quchi (LI11) are selected based on "where the meridian passes, it can treat," while local needling can directly reach the lesion, stimulate local inflammatory substances, and also release adhesions around the shoulder joint. Acupuncture can invigorate the Yang meridian Qi, promote Qi and Blood circulation, unblock meridian obstructions, and thus achieve the effect of resolving stasis and stagnation [22].

4.2 Acupotomy Treatment

Acupotomy is developed from TCM theory combined with modern anatomy, forming a unique theoretical foundation that incorporates both the advantages of traditional acupuncture and characteristics of modern medicine. Due to its advantages of good efficacy, minimal injury, low pain, low cost, and simple operation, acupotomy has been widely used clinically [23]. Clinically, acupotomy treatment mainly involves cutting and stripping the painful muscle attachment points, ligaments, and obstructed bursae in the shoulder, releasing adhesive tissues, relieving excessive stress, removing compression on nerves and blood vessels, improving muscle tension, and restoring the dynamic balance of shoulder biomechanics. Blade needle not only has advantages in early pain relief but also improves patients' shoulder joint mobility and functional recovery to some extent [24]. Lin Chunqiang et al. [25] used small needle-knife therapy for rotator cuff injury patients. The treatment group received four small needle-knife interventions to release the coracoid apex (lateral 1/3), the lesser tubercle, the supraspinatus insertion at the top of the greater tubercle of the humerus, and the subacromial bursa, respectively. The control group received medium-frequency pulse therapy. Results showed that the overall effective rate in the treatment group was higher than that in the control group.

5. Tuina (Therapeutic Massage) Treatment

TCM tuina manipulation is a characteristic and advantageous aspect of TCM Jin Shang treatment, aiming to "Li Jin Zheng Fu" (regulate sinews and restore normal position) and "Shu Jin Tong Luo" (soothe sinews and unblock collaterals). It can release adhesive tissues, relieve local pain, improve microcirculation. Mobilization techniques can adjust the glenohumeral joint, scapulohumeral rhythm, etc., restore the balance of scapulohumeral muscles, correct joint disorders, and promote the recovery of shoulder joint function [26].

Based on the "Meridian-Sinew Theory," practitioners search for "Jie Jin Bing Zao Dian" (sinew-node lesion points, equivalent to trigger points or diseased tendon attachment points) along the shoulder's "Three Yang and Three Yin Sinews of the Hand" and use manipulations like plucking, pinching/pressing, and pushing/scraping for precise release. For example, for supraspinatus tendon injury, focus is on plucking the area of the greater tubercle of the humerus; for subscapularis tendon injury, focus is on releasing the area lateral and inferior to the coracoid process. Han Zhiyou et al. [27] used tuina manipulations to relax scapular muscles, lift and release rotator cuff muscles, trapezius, and other shoulder muscles, combined with myofascial analgesic techniques. After point pressing and plucking the painful areas, rotator cuff injury patients' symptoms like pain and movement significantly improved. Dai Yi et al. [28] believe that meridian-point tuina, acupoints around the shoulder joint, and stimulating distal points like Hegu (LI4) and Quchi (LI11) with a focus on relaxing distal limb muscles, through manipulations like point pressing, palm kneading, and plucking, along the course of the three Yang channels of the hand until a clear sensation of soreness and distension (Deqi) is achieved, can soothe sinews, unblock collaterals, remove stasis, and disperse nodules. Clinically, it significantly improves shoulder joint function rehabilitation and pain in post-operative rotator cuff injury patients.

6. Comprehensive Treatment

In clinical practice, comprehensive plans combining 2-3 therapeutic methods are often used. Multiple treatment methods are combined to adapt to different injury types, alleviate shoulder pain, relieve spasms, restore shoulder joint range of motion, etc., embodying the TCM concept of "Za He Yi Zhi" (combined treatment). Some scholars incorporate modern joint mobilization techniques, applying targeted joint mobilization (e.g., caudal glide, posterior-anterior glide) after muscle relaxation to improve glenohumeral and scapulothoracic joint mobility. Shi Xiaocheng et al. [29] applied acupuncture combined with joint mobilization to treat rotator cuff injury patients, leveraging the advantages of both acupuncture and tuina to enhance treatment efficacy. Results suggested that compared to joint mobilization alone, combined acupuncture treatment could shorten the treatment course, effectively promote patient rehabilitation, and improve treatment outcomes. Shi Yumin et al. [30] treated 52 rotator cuff injury patients with electroacupuncture combined with manual release therapy. After shoulder joint release, acupoints on the affected side like Jianzhen (SI9), Jianyu (LI15), Tianzong (SI11), Binao (LI14), and Jianliao (TE14) were selected. After achieving Deqi, electroacupuncture apparatus was connected. Post-treatment shoulder joint range of motion and pain significantly improved. Su Zhaocheng [31] studied acupotomy combined with internal heat needle therapy for chronic rotator cuff injury, using acupotomy to release adhesions and internal heat needles to promote inflammation absorption, improving shoulder symptoms and achieving disease cure. Zhou Ting et al. [32] applied herbal hot compress, massage combined with rehabilitation training to alleviate pain symptoms and improve shoulder joint function in rotator cuff injury patients. Using herbal hot compress on shoulder muscles relieves pain and lowers serum inflammatory factor levels, thereby restoring shoulder joint function.

7. Shortcomings and Future Prospects

In recent years, with the deepening of TCM treatment, the application of TCM has shown significant efficacy in the prevention, diagnosis, and treatment of rotator cuff injury, especially in reducing shoulder pain and restoring function. Compared to Western medicine, which primarily uses NSAIDs for symptomatic treatment, the combination of various TCM treatment modalities can better release adhesions in shoulder soft tissues and is more readily accepted by patients. However, some issues urgently need resolution: (1) Lack of unified TCM diagnostic and efficacy evaluation standards. TCM syndrome differentiation lacks objective and quantifiable indicators, and there are numerous diagnostic and treatment methods. Further refinement of specific treatment plans for various types of rotator cuff injury is needed. Simultaneously, efficacy evaluation indicators are not yet unified, making objective evaluation difficult. (2) The level of evidence-based proof needs improvement: Existing clinical research mainly consists of small-sample, single-center observational studies. Large-sample, multi-center, randomized clinical trials on TCM treatment for rotator cuff injury are still scarce, and long-term follow-up data is lacking. Future research should focus on conducting high-quality randomized double-blind controlled trials to evaluate the safety and efficacy of treatment methods. (3) Insufficient depth in mechanism research: Most studies remain at the level of phenomenon description and detection of a few indicators. Exploration into the deep mechanisms of core TCM theories like "Gan Shen Tong Tiao" and "Jin Gu Bing Zhi" is just beginning. With the development of TCM clinical techniques, how acupuncture specifically diagnoses and treats rotator cuff injury requires further research. (4) Insufficient optimization of individualized treatment plans: It is still unclear which TCM regimen or combination is more suitable for which type or stage of injury, lacking precise clinical pathways. In summary, rotator cuff injury is a common clinical shoulder joint disease, causing distress and burden to patients and their families. Over the years, TCM has accumulated considerable experience and formulas for the prevention and treatment of rotator cuff injury, with a sound theoretical system, diverse methods, and unique advantages.

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