

Rehabilitation of Rotator Cuff Injuries: Integrative Perspectives from Traditional Chinese and Western Medicine

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Abstract. Rotator cuff injury is one of the most prevalent tendon disorders of the shoulder, with the highest prevalence in patients over 60 years and in occupations or sports requiring sustained overhead load. It arises from chronic tendon degeneration and repetitive microtrauma, often aggravated by acromial morphology, reduced subacromial space, or scapular dyskinesis. Patients typically present with nocturnal shoulder pain, weakness during abduction and external rotation, and in advanced cases, stiffness or secondary arthropathy. Western treatments include analgesic drugs, structured physiotherapy, shockwave therapy, and arthroscopic repair, where the extent of tendon retraction, degree of fatty infiltration, and expected functional demand largely determine therapeutic choice. Despite advances, high retear rates persist in specific subgroups. Traditional Chinese Medicine (TCM) therapies such as acupuncture, manual techniques, and herbal preparations have been shown in pilot trials to decrease pain scores and enhance range of motion, possibly via modulation of local cytokine expression and peripheral nerve excitability. Integrative strategies are designed to accelerate rehabilitation timelines, minimize reliance on corticosteroids or opioids, and optimize restoration of shoulder strength and endurance. This review evaluates the comparative outcomes of conservative, surgical, and traditional modalities, highlights preliminary signals of benefit from integrative care, and identifies methodological priorities including standardized outcome measures and multicenter randomized trials.

Keywords: Traditional Chinese medicine, rotator cuff injury, acupuncture, rehabilitation.

1. Introduction

The rotator cuff is a sleeve-like structure composed of the tendons of the supraspinatus, infraspinatus, teres minor, and subscapularis muscles, which encircle the superior, posterior, and anterior aspects of the humeral head. Damage to these structures caused by trauma, overuse, degenerative changes, etc., is referred to as a rotator cuff injury. Rotator cuff injury is a common shoulder condition with a relatively high incidence rate, and it is particularly prevalent among athletes as well as middle-aged and elderly individuals. Epidemiological studies indicate that more than one-fifth of the global population suffers from rotator cuff injury. With the intensification of population aging, the incidence rate of rotator cuff injury is on the rise. The occurrence of rotator cuff injuries is closely related to factors such as overuse, age-related degeneration, trauma, and improper shoulder posture. The main clinical symptoms include shoulder pain, limited mobility, muscle weakness and so on. In severe cases, it may lead to long-term pain and shoulder joint dysfunction, which seriously affects the patient's quality of life [1].

The underlying mechanisms of rotator cuff injury are described in distinct ways across medical traditions. Western medicine attributes the pathology mainly to structural and biomechanical factors, including progressive tendon degeneration from repetitive overhead loading and acute traumatic tears often associated with subacromial impingement or acromial morphology. In contrast, TCM explains this condition from the perspective of holistic imbalance, regarding circulatory impairment as well as reduced repair capacity as the intrinsic driving factors behind persistent pain and delayed healing. Current management strategies include Western medical approaches such as drug therapy, physical therapy, and surgical repair, as well as traditional practices like acupuncture, manual intervention, and herbal preparations. Non-surgical measures can alleviate symptoms in partial or early-stage tears but are often insufficient when the tendon quality is severely compromised. Surgical repair offers the possibility of anatomical reconstruction and functional recovery, yet the therapeutic outcomes are

strongly influenced by the degree of tendon degeneration, tear size, and postoperative compliance, with the high retear rate remaining a concern. TCM interventions act more gradually, but their advantages lie in improving circulation, reducing inflammation, promoting systemic recovery, and causing fewer treatment-related complications [2].

In recent years, integrated approaches combining traditional Chinese and Western medicine have attracted increasing attention in the management of rotator cuff injuries, aiming to leverage the advantages of both systems. Western medicine provides precise diagnostic tools and means for structural repair through physical therapy, pharmacological treatment, and surgery, while TCM emphasizes systemic regulation, pain relief, and promotion of tissue repair through acupuncture, manual therapies, and herbal preparations. By combining these treatment modalities, integrative strategies of traditional Chinese and Western medicine aim to reduce drug-related adverse reactions while achieving better therapeutic effect that cannot be attained by either medical system alone. Nevertheless, such therapies still face significant challenges, including marked variability in patient responses, the lack of standardized treatment protocols, and inconsistent clinical efficacy. This review summarizes current therapeutic strategies for rotator cuff injuries, with a focus on exploring the clinical application of integrative medicine, analyzing its potential role in rehabilitation, and identifying research priorities needed to establish a more robust evidence base.

2. Pathological Mechanism and Clinical Symptoms

2.1. Pathological Mechanism

The formation of rotator cuff injuries is mainly related to degenerative changes in tendons, acute trauma, chronic strain, and anatomical abnormalities. Aging, repetitive movements, improper exercise and external impact are common causes, long-term heavy physical labor or repetitive shoulder movements with the rotator cuff constantly pulled and rubbed, may lead to chronic wear and tear of the rotator cuff. As one grows older, degenerative changes in rotator cuff, the elasticity and strength of tendons gradually decrease make the part becoming fragile. Then if affected by external forces such as direct impact or sprain, it may cause acute injuries such as rotator cuff tendon strain and tear. Subsequently, clinical symptoms such as redness, swelling, heat, and pain will appear. In Anatomy, narrowing of the subacromial space or abnormal morphology of the acromion can also exacerbate mechanical compression, making the occurrence of injury more susceptible.

The interpretation of TCM, rotator cuff injury is not only a result of local strain, but also related to overall functional status. If blood circulation is poor or tissue nutrition is insufficient, local strain is more likely to cause long-term pain and slow recovery. On the one hand, some patients due to insufficient overall vitality and weakened tissue repair ability may experience a prolonged course of illness, on the other hand other patients may experience worsening symptoms in humid or cold environments, indicating that external factors may also affect their condition. This type of viewpoint emphasizes the relationship between local tissue damage and overall bodily function, providing a supplementary explanation for rotator cuff injury that differs from structural pathology.

2.2. Clinical Symptoms

Clinical symptoms vary according to the extent and severity of the injury. Mild rotator cuff injuries often present with intermittent pain and restricted specific movements which can be relieved by rest. Moderate injuries are usually accompanied by persistent pain and limited active movement, and may also result in muscle atrophy or joint clicking. Severe injuries may lead to exacerbated shoulder joint pain, seriously restricted mobility and even muscle atrophy, joint adhesions or osteoarthritis. Accurate diagnosis of a rotator cuff injury requires the integration of the patient's medical history, targeted clinical assessment and imaging confirmation. Patients typically present with shoulder pain that worsens during overhead activities, experience nocturnal discomfort, feel weakness when abduction and external rotation. Physical examination often reveals limited range of motion of the shoulder joint. Meanwhile, positive results in tests such as the Empty Can test and Drop Arm test may be observed,

all of which indicate supraspinatus muscle dysfunction. Imaging examinations play a decisive role in diagnosis. Magnetic Resonance Imaging (MRI) can clearly show the integrity of tendons and the status of muscle atrophy, while ultrasonography provides a dynamic and cost-effective method for detecting partial-thickness or full-thickness tendon tears.

3. Western Medical Approaches to Rotator Cuff Injury

3.1. Conservative Management

There are no universally accepted criteria for conservative management of rotator cuff injury. In clinical practice, non-surgical treatment is typically considered for patients with recent injuries of less than three months' duration, those presenting with mild symptoms consistent with Neer stage I, individuals with partial-thickness tears or tendinopathy classified as Ellman grade I or II with less than 50% tendon involvement, and patients with full-thickness tears who decline or are unsuitable for surgical intervention [2].

Drug therapy is often used to control pain and improve function. Nonsteroidal anti-inflammatory drugs (NSAIDs) may be used as appropriate for patients who are suffering from persistent pain or pain that is moderate to severe from rotator cuff injuries. An assessment is required before medication use. When the patient is at risk of gastrointestinal hemorrhage or cardiovascular negative events, it should be used with caution. For patients who are ineffective with NSAIDs or have contraindications to medication, opioid analgesics may be considered, but such preparations are addictive and should be used with caution. A study included 60 patients who have suffered from rotator cuff syndrome for a minimum of 3 months and divided them into treatment with steroids or nonsteroidal anti-inflammatory drugs [3]. The results showed that there was no statistically significant difference in age, gender, pain duration, VAS score, ASES score, and UCLA score between the two groups before treatment. From the 3rd to the 12th week after treatment, the VAS, ASES, and UCLA scores of both groups improved ($p < 0.000$). The VAS pain score in the NSAID group was 6.8 ± 0.4 before treatment and improved to 1.8 ± 1.7 , 1.1 ± 1.8 , and 0.9 ± 1.8 at 3, 6, and 12 weeks after treatment, respectively. The VAS pain score in the steroid group was 6.9 ± 0.4 before treatment and improved to 2.2 ± 1.7 , 1.3 ± 1.7 , and 1.3 ± 2.1 at 3, 6, and 12 weeks after treatment, respectively. The ASES pain score in the NSAID group was 33.1 ± 8.9 before treatment and improved to 83.1 ± 15.0 , 88.1 ± 16.2 , and 90.3 ± 15.9 at 3, 6, and 12 weeks after treatment, respectively. The ASES pain score in the steroid group was 31.9 ± 8.7 before treatment and improved to 80.1 ± 15.3 , 87.4 ± 16.5 , and 87.0 ± 20.1 at 3, 6, and 12 weeks after treatment, respectively. The UCLA score in the NSAID group was 16.0 ± 1.4 before treatment and improved to 30.8 ± 5.3 , 32.4 ± 5.3 , and 33.2 ± 5.0 at 3, 6, and 12 weeks after treatment. Scores belonging to the steroid group were 15.9 ± 1.4 , 31.2 ± 4.9 , and 31.0 ± 5.9 , respectively. Results showed that Significant improvements in pain relief and functional improvement were witnessed by both groups, with no statistically significant differences. This suggests that nonsteroidal anti-inflammatory drugs can achieve similar therapeutic effects as injection therapy in most cases.

Extracorporeal shock wave therapy (ESWT) and therapeutic ultrasound are commonly applied in the rehabilitation of rotator cuff injury, sometimes combined with acupuncture, manual therapy, or topical traditional remedies to improve range of motion and reduce pain associated with activity. A meta-analysis of 16 randomized controlled trials including 1093 patients showed that ESWT significantly reduced pain scores on the Visual Analogue Scale (SMD = -1.95), improved functional capacity on the Constant-Murley Score (SMD = 1.30), and increased external rotation mobility (SMD = 1.00) compared with controls [4]. However, no clear benefit was observed for shoulder abduction. These findings indicate that ESWT may provide superior outcomes in pain relief and shoulder function relative to standard care. Yet its biological mechanism remains incompletely understood, inter-patient variability in response is considerable, and the most effective way to integrate ESWT with other rehabilitation strategies has not been established. Addressing these gaps will require rigorously designed multicenter randomized trials.

3.2. Surgical Management

Certain patients with rotator cuff injuries may achieve satisfactory outcomes through non-operative treatment. However, longitudinal observations indicate that, in the absence of surgical intervention, rotator cuff tears tend to enlarge over 5–10 years, with parallel progression of muscle atrophy and fatty infiltration. These irreversible degenerative changes not only limit the long-term efficacy of conservative treatment, but also provide theoretical basis for surgical treatment. However, there is still controversy over the surgical treatment of rotator cuff injuries and no universally recognized standard exists. Doctors are required to take into account not only the risks and benefits of surgical treatment but also to dynamically evaluate the progression of the patient's condition and make adjustments to the treatment plan as per the situation. The most suitable treatment plan should be developed based on the patient's condition to achieve maximum therapeutic effect. The surgical treatment reference indications cover partial rotator cuff tears or tendinopathies that fail to respond well to non-operative treatment, Patients who have total rotator cuff tears along with those who are acutely injured with rotator cuff tears exceeding 1 cm.

The principal types of rotator cuff repair surgeries encompass open surgery, small incision surgery assisted by arthroscopy, and total arthroscopic surgery. Compared with the other two surgical methods, total arthroscopic surgery is less invasive and has a faster recovery time, and has been established as the gold standard in treating rotator cuff tears. In clinical practice, the rotator cuff repair and fixation methods that are commonly used encompass suture bridge fixation, double-row fixation, and single-row fixation. Among them, double-row and suture bridge repair have certain advantages in restoring mechanical stability and reducing the re-tear rate, but the complexity and cost of the operation also increase accordingly. For patients with partial tears, the scope of the lesion should be explored during surgery. If there are impingement signs, subacromial decompression is required. If the tear thickness is less than 50%, arthroscopic debridement can be performed alone. If the tear is longer or deeper, the lesion tendon needs to be repaired. For patients with combined long head of biceps tendon injury, long head of biceps tenotomy can be performed [2].

Evidence-based research supports the efficacy of surgery. A meta-analysis of six clinical trials showed that surgical repair can significantly relieve pain and improve function at 6, 12, and 24 months after surgery compared with conservative treatment [5]. However, the risks of surgery include anesthesia-related complications, infection, neurovascular injury, and joint stiffness. More challenging is that the postoperative re-tear rate varies significantly, with different studies reporting a range of 11% to 94%. This problem reflects that even in the context of continuous technological development, multiple factors such as tissue quality, tear extent, intraoperative fixation method, and patient compliance still have a key impact on the long-term efficacy of surgery [6]. In clinical practice, the choice between conservative and surgical repair often depends on the patient's age, exercise needs, and concomitant diseases. For elderly patients or patients with systemic diseases, surgery may increase perioperative risks; relying solely on conservative treatment is difficult to prevent tendon degeneration and tear progression. Some scholars have tried to explore comprehensive intervention plans, combining surgery with rehabilitation training, physical therapy, and biological assistive technology to improve function while reducing the re-tear rate. This type of research not only emphasizes the complementarity of different treatment methods, but also suggests that the management of rotator cuff injuries in the future requires a more refined stratified strategy rather than the application of a single model.

4. Traditional Chinese Medicine Approaches

4.1. Acupuncture and Moxibustion Therapy

Non-surgical management of rotator cuff injury can involve acupuncture combined with moxibustion, tailored according to symptom patterns. Acupuncture techniques such as filiform needling, warm needling, and electroacupuncture are applied in different clinical contexts: filiform

needling for patients experiencing pain, weakness, and restricted motion across various stages of injury; warm needling for individuals with cold-sensitive shoulder pain that improves with heat. Moxibustion, performed with ignited moxa placed directly or indirectly over acupoints or the affected region, provides sustained thermal stimulation that modulates local circulation and inflammatory activity. Prior to therapy, clinicians are advised to assess the patient's condition, as treatment during fasting, fatigue, or heightened stress may exacerbate discomfort [2]. A meta-analysis of 13 randomized controlled trials comprising 1371 participants demonstrated that acupuncture, either as monotherapy or as an adjunct to physical therapy, provided greater clinical benefit than comparison interventions. Significant advantages were noted in functional recovery at both short-term (SMD = -0.82) and medium-term follow-up (SMD = -1.00), in pain reduction (WMD = -1.37 and -1.66), and in post-treatment shoulder abduction (SMD = 0.68) [7]. Based on the current clinical data, meta-analysis showed that acupuncture alone or combined with physical therapy is efficacious for short- and medium-term (less than 3 months) pain relief and functional improvements. However, compared to other interventions, the efficacy of the long-term (3 to 12 months) period did not significantly differ.

4.2. Manual Therapy for Functional Rehabilitation

Manipulative therapy (MT) is applicable to the period of functional recovery for rotator cuff injury. Applying acupressure, pinching, palm pushing, stretching and other manipulations to the affected shoulder can promote blood circulation, unblock the meridians, loosen the tendons and dissipate masses, and smooth the joints. It is capable of improving joint stiffness and muscle strength, relieve joint pain, and speeding up the recovery of shoulder joint function. Manipulative therapy should not be used in the acute phase to avoid aggravating the condition [2]. A meta-analysis of 24 randomized controlled trials involving 1,110 patients showed that massage therapy alone had limited effect on pain relief (SMD = -0.25) and was not significantly effective in improving function (SMD = 0.20). However, when massage was combined with exercise training, the therapeutic effect was significantly enhanced, significantly reducing pain (SMD = 0.36) and improving joint function (SMD = 0.32). Further analysis also found that massage combined with multimodal physical therapy was more effective in pain relief and functional recovery (SMD = 0.77) [8]. These findings highlight the excellent pain relief and functional improvement provided by massage when combined with exercise or physical therapy. Therefore, massage has become a key component of rotator cuff injury treatment intervention.

4.3. Topical and Oral Approaches

TCM has been applied in the rehabilitation of rotator cuff injury, particularly during the recovery phase when patients experience persistent pain and limited mobility. Its interventions are delivered in both topical and oral forms. Topical agents, prepared from herbs with vasodilatory and anti-inflammatory properties such as safflower or angelica, are commonly used as poultices or heated compresses to alleviate local swelling and pain. Oral formulations are often prescribed for patients with prolonged recovery or systemic weakness, aiming to improve tissue repair capacity by enhancing nutrient delivery to muscles and tendons and by modulating immune activity. Clinical reports over the past decade indicate that TCM interventions can reduce shoulder pain scores and improve abduction or rotation range of motion, with several trials documenting faster functional recovery when combined with physiotherapy or structured exercise programs compared to either approach alone. Mechanistic studies suggest that specific phytochemicals, including flavonoids and saponins, may contribute by downregulating pro-inflammatory cytokines, improving microvascular perfusion, and facilitating collagen fiber reorganization and angiogenesis. Despite these promising findings, most published studies are limited by small sample sizes, heterogeneous herbal formulations, and insufficient standardization in dosing. Rigorous multicenter randomized controlled trials and pharmacological profiling are required to establish reproducible evidence and clarify safety profiles.

5. Integrated Traditional Chinese Medicine and Western Medicine

5.1. Clinical Advantages of Integrated Approaches

The integration of Chinese and Western medicine enables the development of personalized treatment plans tailored to individual patient conditions. In clinical practice, this strategy not only reduces reliance on high-dose analgesics but also incorporates targeted TCM interventions, such as acupuncture and herbal medicine therapy and so on that can modulate pain perception and support tissue repair. A randomized controlled study involving 100 patients who underwent arthroscopic rotator cuff repair showed that compared with the baseline level and the control group, patients receiving integrative care achieved significantly greater improvements in the Constant-Murley score which covers pain, range of motion, and muscle strength. The experimental cohort also had lower VAS scores and Shoulder Pain and Disability Index (SPADI) scores and enhanced performance in specific muscle groups that including shoulder flexors, external rotators, and internal rotators with corresponding gains in flexion, abduction, and extension. These findings suggest that, when delivered within a multidisciplinary team framework, integrative protocols can provide more robust functional recovery than single-modality care, highlighting the value of coordinated therapeutic strategies in postoperative rehabilitation [9].

5.2. Current Challenges and Limitations

Although the integration of TCM and Western medicine has attracted increasing clinical attention, its implementation still encounters several unresolved problems. Patient heterogeneity is a central issue: treatment outcomes vary according to tear size, chronicity, concomitant shoulder pathology, and baseline physical condition, which complicates the development of uniform protocols and often forces clinicians to rely on personal experience. The current evidence base is also weak. Most published studies are limited to small single-center cohorts, lack follow-up beyond one year, and seldom employ rigorous randomization, which reduces both comparability and reproducibility. In the case of TCM interventions, syndrome differentiation allows individualized prescriptions, but this individualized approach makes it difficult to generate reproducible datasets suitable for guideline development.

Another obstacle lies in the gap between medical systems. Western medicine relies heavily on imaging markers and validated functional scoring systems, whereas TCM assessments prioritize symptom relief and perceived systemic balance. Without a shared framework for evaluating outcomes, cross-system comparisons remain inconsistent. Beyond methodology, structural barriers also exist. In many regions, reimbursement for integrative approaches has not been institutionalized, postgraduate training in combined practice is limited, and multidisciplinary team structures remain fragmented. These systemic shortcomings, rather than theoretical incompatibility, represent the primary bottlenecks to advancing evidence-based integrative care for rotator cuff injury [10].

6. Conclusion

The rotator cuff plays a crucial role in maintaining shoulder joint stability and coordinating shoulder movements. The prerequisites for developing of systematic treatment plan is accurate diagnosis and individualized classification. Western medical treatments typically alleviate symptoms and restore function through medication, physical therapy or surgery. However, these methods may be accompanied by side effects and carry the risk of postoperative recurrence. TCM emphasizes holistic regulation and functional restoration. It has advantages in alleviating pain and promoting recovery but its onset of effect is relatively slow. The Integrated Chinese and Western Medicine treatment fully leverages the complementary strengths of both systems, providing more flexible and personalized treatment options for different types. Integrative Medicine is a new diagnostic and treatment approach that integrates the two major medical systems of TCM and Western medicine. It can not only quickly relieve symptoms, but also improve the overall condition, thereby improving

quality of life and promoting long-term recovery. However, current research lacks evidential support, standardized diagnostic and treatment standards as well as large-scale multicenter clinical validation. In the future, more studies are needed to further verify the efficacy and safety of integrated Chinese and Western medicine treatment in a broader patient population with evidence-based evaluations. This will promote the formulation of scalable diagnostic and treatment standards and provide patients with more scientific, precise, and efficient treatment pathways.

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