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Application and research progress of acupuncture and moxibustion therapy in sports medicine: a short review

The theoretical basis of acupuncture and moxibustion in traditional Chinese medicine is recognized as "dredging meridians, promoting blood circulation, and removing blood stasis". In modern medical theories, the mechanism of acupuncture and moxibustion is discussed as "analgesia, improving the microenvironment, influencing hormone release and inflammatory mechanism". Many studies have confirmed its healing effects and established it as an effective method for treating sports medicine conditions. The application of acupuncture and moxibustion in the treatment of sports medicine conditions, such as tendinopathy, myofasciitis, ligament injury, peripheral nerve injury, tendon and bone healing, has been analyzed to understand its clinical efficacy and mechanism. Although acupuncture and moxibustion are widely used in sports medicine conditions, most of the current studies are retrospective and lack randomized double-blind controlled trials. Future research should include more randomized double-blind trials, using multi-center and large sample clinical observation, to further confirm the efficacy of acupuncture and moxibustion in the treatment of sports medicine disorders and improve its clinical application.

Keywords: acupuncture therapy, moxibustion therapy, sports medicine, curative effect, traditional Chinese medicine, tendinopathy, myofasciitis, ligament injury.

Introduction

Acupuncture, which includes both "needle" and "moxibustion", is an important part of traditional Chinese medicine. Throughout its origin, practice and historical development, acupuncture has preserved distinct Chinese cultural and regional characteristics. It has also spread throughout the world as a valuable heritage of Chinese national culture and scientific tradition. The clinical application acupuncture and moxibustion therapy is characterized by its simplicity, cost-effectiveness, safety and reliability, and remarkable efficacy. This therapy is widely used in various medicinal fields, including internal medicine, surgery, gynecology, pediatrics, and more (Fig.). With the continuous progress of the aging society, the incidence of various sports medicine diseases such as tendinopathy, myofasciitis, ligament injury, peripheral nerve injury, and tendon-bone injury is increasing. These conditions now account for 60 % to 70 % of orthopaedic outpatient visits. The high prevalence of sports medicine conditions imposes a significant economic burden on individuals and society, highlighting the need for cost-effective treatments with excellent curative effects. Acupuncture is recognized as a leading traditional medical treatment in 113 countries worldwide.

Acupuncture was first legalized in Nevada and California in 1972, and has since been approved in 44 states and Washington, D.C. In Canada, for example, comprehensive acupuncture coverage is as high as

88 %, demonstrating its therapeutic efficacy. However, the increased popularity of acupuncture and moxibustion has also led to complications, including infection, central nervous system damage, and even death. This paper reviews the research progress of acupuncture in the treatment of various sports medicine conditions by reviewing the relevant literature.

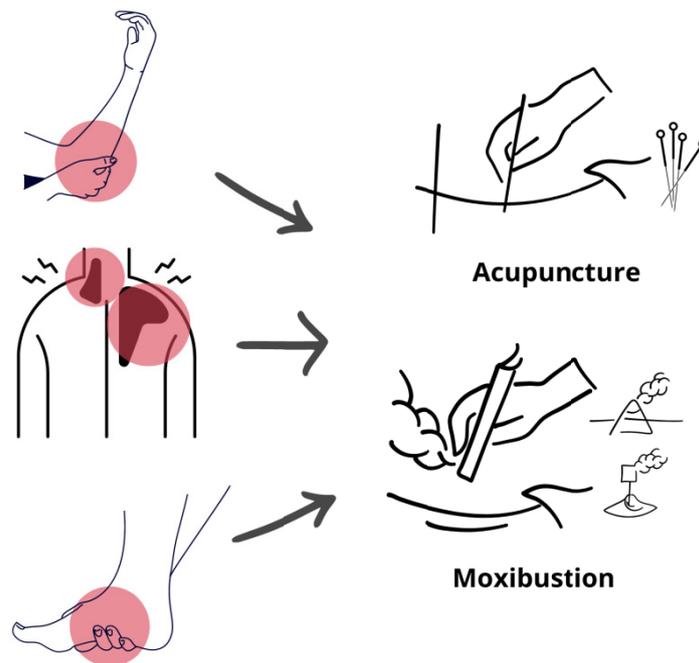


Figure. Acupuncture (practice puncturing the skin with needles) and moxibustion therapy (practice that entails burning dried mugwort) application

1 Tendinopathy

Tendinopathy refers to degenerative changes in tendon tissue caused by overexertion, minor trauma, or exposure to cold. It is characterized by aseptic inflammation, with clinical manifestations primarily including pain and dysfunction. This condition has a significant impact on the patient's daily life and work, resulting in significant disability. Among the various types, supraspinatus tendinitis is a common shoulder disorder, with epidemiologic studies indicating a high prevalence in young and middle-aged individuals, with an incidence rate of approximately 20 %. Achilles tendinopathy occurs in approximately 11 % of track and field athletes, 9 % of dancers, and 7 % to 9 % of elite distance runners. The unique lifestyle demands of athletes often result in recurrent tendinopathy, severely limiting their athletic careers. Currently, the clinical management of tendinopathy consists mainly of symptomatic supportive care, which is often not very effective [1].

In Traditional Chinese Medicine (TCM), tendinopathy is classified under the category of “myobi”. The theoretical mechanism of TCM attributes tendinopathy to the invasion of external pathogens, blocked qi and blood flow, blood stasis and meridian obstruction. Acupuncture and moxibustion can dilate local blood vessels, accelerate blood flow, promote inflammatory absorption, and facilitate tissue repair. These therapies also warm the meridians, promote qi and blood circulation, disperse blood stasis, and eliminate pathogenic factors, achieving good therapeutic effects in the clinical treatment of tendinopathy. For example, Huang treated patients with quadriceps tendon terminal disease with warm acupuncture and moxibustion, achieving cure in 9 cases, effectiveness in 6 cases, and ineffectiveness in 1 case, with a total effectiveness rate of 93.8 %. In clinical practice, acupuncture and moxibustion are often combined with other treatments. A study of 50 cases of supraspinatus tendinitis treated with acupuncture and massage reported an overall efficacy rate of 96.0 % [2]. Zhao et al. treated 30 cases of biceps brachialis tendinitis with acupuncture and acupoint injection; 12 cases were cured after one course of treatment (acupuncture once a day, five sessions per course), 15 cases after two courses, and one case after three courses. In another study of 41 patients with supraspinatus tendinitis, 21 were randomly assigned to a treatment group (acupuncture combined with shoulder joint loosening training) and 20 to a control group (injection of 2 % lidocaine hydrochloride with triamcinolone ace-

tate). The overall efficacy rate was 100 % in the treatment group compared to 65 % in the control group. Papa, a Canadian scientist, reported a successful case of Achilles tendinopathy treatment with acupuncture and moxibustion, noting significant pain relief and restoration of lower limb function after nine weeks of treatment. No recurrence was observed after 12 months of follow-up, demonstrating the efficacy of acupuncture and moxibustion in the treatment of Achilles tendinopathy [3, 4]. In addition, British researchers have suggested that acupuncture may relieve pain and stimulate the release of growth factors in the treatment of tendinopathy, although the specific mechanisms require further experimental confirmation.

2 Myofasciitis

Myofasciitis is a pain syndrome characterized by tension in muscle cords, highly localized and irritating trigger points, referred pain to other areas of the body, and referred depression. It commonly affects the neck, back, and buttocks. Clinically, myofasciitis is often accompanied by anxiety, depression, sleep disturbances, and other mental health issues that can exacerbate pain and dysfunction, creating a vicious cycle. Myofasciitis itself is not a self-limiting disease; it can also cause referred pain or inhibition in muscles other than the one where the pain is located, leading to persistent dysfunction. Foreign epidemiologic studies have shown that the incidence of low back pain in the population is about 62 % to 86 %, and 85 % of these patients suffer from myofascial pain. The most common age range for this condition is 30 to 50 years, but it is increasingly affecting younger people. It affects approximately 44 million people in the United States and has an annual economic impact of \$47 billion. The most common treatment for myofasciitis is conservative oral drug therapy, primarily non-steroidal anti-inflammatory drugs (NSAIDs). However, these drugs have significant side effects and are relatively expensive, making patients reluctant to use them. Acupuncture and moxibustion have been widely used in clinics for the treatment of myofasciitis and have shown obvious curative effects [5].

In TCM, myofasciitis is considered a form of “myobi” and myocoagulation syndrome. The etiology and mechanism are primarily explained by the sluggish operation of local Qi and blood, often due to liver and kidney deficiency or tendon injuries caused by labor. This, combined with external factors such as wind, cold and dampness, can lead to tendon and vein damage and, in severe cases, muscle obstruction and Qi and blood stasis [6]. Acupuncture and moxibustion play a role in dredging meridians and collaterals, regulating Qi and blood, and can achieve the effects of fuzhen (strengthening the body's resistance) and dispelling evil spirits after treatment. In a study, Ding Xiyang and Liu Shunyi treated 30 patients with back muscle myositis using acupuncture once a day for three days as a single treatment. The results showed that 19 cases were cured, 11 cases were effective, and none were ineffective, with a 100 % effectiveness rate. Another clinical trial of 78 patients with myofascial pain syndrome compared acupuncture and shock wave therapy. After 20 days, the significant efficacy of the acupuncture group was 84.6 %, compared with 61.5 % in the shockwave group, indicating that acupuncture had a better effect on myofascial pain syndrome [7]. In addition, combining acupuncture and moxibustion with other treatments has been shown to be more effective. In one study, patients were treated with a combination of scraping and warm acupuncture and moxibustion, while the control group received acupuncture and moxibustion alone [8]. The results showed that the significant efficacy of the control group was 84.0 %, while all patients in the treatment group showed significant improvement. Another study by Wu et al. randomly divided 120 patients with lumbar and back myofasciitis into two groups: the treatment group received acupuncture and moxibustion combined with acupuncture and blood-letting, while the control group received acupuncture alone. The results showed that the efficacy rate was significantly higher in the treatment group (91.67 %) than in the control group (71.67 %), suggesting that combining acupuncture and moxibustion with other methods can achieve better efficacy in the treatment of myofasciitis [9].

3 Ligament injuries

When a ligament is subjected to external direct or indirect forces, it can experience abnormal physiological stress, resulting in excessive stretching. If the force exceeds the ligament's tolerance, an injury can result. In Finland, with a population of only 5 million, more than 200,000 cases of acute tendon injuries occur each year. In the United States, approximately 30 % to 50 % of sports injuries are tendon strains. Approximately 100,000 to 200,000 patients suffer ACL injuries each year, or about 1 in 3,000 people. In addition, more than 51 % of people over the age of 80 experience a rotator cuff injury each year. The high prevalence of tendon injuries places a significant financial burden on healthcare systems worldwide. For example, direct medical expenditures for rotator cuff repair in Australia exceed \$250 million per year, while the U.S. government spends more than \$7 billion annually on rotator cuff injuries [9].

In TCM, ligament injuries are often classified as “Bi Syndrome”. The acupuncture and moxibustion treatment approach combines the principles of “pain as transfusion” and meridian-based acupuncture point selection, which not only provides effective analgesia, but also promotes circulation, reduces swelling and increases blood flow. This approach helps restore normal muscle and joint function. Acupuncture and moxibustion have been widely used in the clinical treatment of ligament injuries, with numerous studies confirming its therapeutic benefits. For example, studies have shown that acupuncture can significantly improve the recovery of proprioception in patients with lateral ankle ligament injuries, often surpassing the results of conventional physical therapy [10]. Kasuya conducted a study in which 60 patients with old lateral collateral ligament injuries of the interphalangeal joints were randomly divided into an acupuncture group and a physiotherapy group. The acupuncture group received mild moxibustion, while the physiotherapy group was treated with TDP irradiation. After 20 days of treatment, the overall excellent, good, and optimal rates were significantly higher in the acupuncture group (83.3 % and 56.7 %, respectively) than in the physiotherapy group (76.7 % and 36.7 %, respectively). These results suggest that acupuncture and moxibustion are particularly effective in the treatment of old interphalangeal joint collateral ligament injuries [11]. In another study, Zhang et al. treated 40 patients with ankle ligament injuries with acupuncture. The duration of treatment ranged from 5 days to 20 days, with an average of 10 days. The final results showed a 98 % cure rate with acupuncture therapy [12]. These results suggest that acupuncture is effective in treating various ligament injuries, providing benefits such as pain relief, improved circulation, and faster recovery of joint function.

4 Peripheral nerve injuries

Peripheral nerve injury is one of the most common conditions in sports medicine with a high incidence rate. An epidemiologic survey indicates that there are approximately 170,579 cases of upper extremity nerve injury annually in the United States. In addition, peripheral nerve injuries often result in a high rate of disability, causing limb dysfunction in patients and significantly impacting their quality of life. The treatment and rehabilitation process for these injuries can be lengthy and costly, with an annual growth rate of 9.59 %. This places a significant financial burden on families and society. Despite advances in surgical techniques and pharmacological treatments, recovery of nerve regeneration is typically slow, overall outcomes are not always satisfactory, and treatment costs remain high. There is an urgent need for comprehensive therapies to improve the rehabilitation of peripheral nerve injuries [13].

In TCM, peripheral nerve injuries are categorized under terms such as “tendon injury”, “Bi syndrome” and “impotence syndrome”. Lu et al. reported successful treatment of ulnar nerve injury with acupuncture. In their study, a patient with a completely severed ulnar nerve and partial muscle damage due to a sharp instrument cut on the forearm received acupuncture treatment after surgical suture and conventional rehabilitation therapy. Acupuncture was applied to the ulnar nerve sulcus and innervated dorsal hand area, and low-frequency electrical stimulation (2 Hz, 6 mA) was applied once a week for six months. The patient reported pain relief within the first month, gradual recovery of motor function by the third month, and was able to return to work. By the sixth month, the patient's motor and sensory functions had almost returned to normal [14]. Another study by Chang et al. examined the effectiveness of acupuncture in the treatment of peripheral nerve injury. Patients were randomly assigned to one of three groups: electroacupuncture alone, warm acupuncture alone, or a combination of electroacupuncture and warm acupuncture. Treatment was administered daily for 45 days. The study found that the combination of warm acupuncture and electroacupuncture was significantly more effective than the other two treatment modalities, as evidenced by improvements in knee osteoarthritis [15]. Anandkumar and Manivasagam also investigated the efficacy of acupuncture in the treatment of cubital tunnel syndrome. They evaluated functional outcomes after ulnar nerve repair using the Lascar grading method. The results showed that patients in the acupuncture group had significantly better improvements in the Visual Analog Scale score and motor sensory function of the hand compared to the control group [16].

5 Tendon-bone healing

The effectiveness of tendon-bone healing is a critical determinant of the success of postoperative ligament repair and reconstruction procedures. This is especially true for patients undergoing procedures such as knee cruciate ligament, lateral collateral ligament, posterolateral stress reconstruction, shoulder rotator cuff repair, or ankle ligament reconstruction. The extent of tendon-bone healing has a direct impact on the postoperative rehabilitation process and overall surgical outcome. Although there are relatively few direct studies on the effects of acupuncture on tendon-bone healing, some research indirectly supports the beneficial role of acupuncture in this area. Rha et al. conducted a study in which 39 patients with supraspinatus tendon injuries were divided into two groups: one treated with acupuncture and moxibustion, and the other treated with ul-

trasound-guided platelet-rich plasma injections. After six months of follow-up, shoulder pain and disability scores were significantly lower in the acupuncture group (17.7 ± 3.7) than in the platelet-rich plasma group (29.5 ± 3.8). This finding suggests that acupuncture is superior to platelet-rich plasma in the treatment of supraspinatus tendon injuries, and numerous studies have confirmed that platelet-rich plasma significantly aids in promoting tendon and bone healing [17]. Yu et al. conducted another study in which 60 patients who had undergone rotator cuff repair were randomized into two groups. The control group received standard postoperative rehabilitation training, while the observation group received the same treatment combined with warm shoulder acupuncture three times for 12 weeks. The results showed that the observation group had significantly better results in VAS and Constant-Murley scores ($P < 0.05$) compared to the control group. This indicates that warm acupuncture can enhance the recovery of shoulder joint function, reduce pain, and promote tendon and bone healing in patients after rotator cuff repair [18].

Conclusion

Acupuncture and moxibustion have been used extensively in the treatment of sports-related disorders, with promising results. However, most studies to date are retrospective and lack the rigor of randomized, double-blind, controlled trials. Future research should focus on conducting more randomized, double-blind trials to validate the efficacy of acupuncture in the treatment of sports medicine conditions. In addition, these studies should aim to explore the mechanisms of action through multicenter and large-sample clinical observations. In conclusion, acupuncture and moxibustion offer definitive therapeutic benefits for sports medicine disorders, with the advantages of being cost-effective and having minimal adverse effects, making them worthy of wider clinical adoption and application.

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Спорттық медицинадағы инемен емдеу мен күйдіру терапиясының қолданылуы мен ғылыми-зерттеу жетістіктері: қысқаша шолу

Дәстүрлі қытай медицинасының теориялық шеңберіндегі инемен емдеу мен күйдіру терапиясының теориялық негізі «меридиандарды тереңдету, қан айналымын ынталандыру және тоқырауын жою» әдісі деп танылады. Қазіргі медициналық теорияларда инемен емдеу мен күйдіру механизмдері «анальгезия, гормондардың бөлінуіне және қабыну механизміне әсер ететін микроортаның жақсаруы» ретінде талқыланады. Көптеген зерттеулер оның емдік әсерін растады және ол спорттық медицинада тиімді емге айналды. Спорттық медицина ауруларын емдеуде инемен емдеу мен күйдіру терапиясының мүмкіндіктері талданды, сонымен қатар тендинопатияны, миофасцитті, байламдардың зақымдануын, перифериялық нервтерді, сіңірлер мен сүйектерді емдеуді және басқа ауруларды емдеуде инемен емдеу мен күйдіруді қолданудың клиникалық тиімділігі мен механизмі зерделенген. Инемен емдеу мен күйдіру спорттық медицина ауруларында кеңінен қолданылғанымен, қазіргі зерттеулердің көпшілігі ретроспективті және қос соқыр рандомизацияланған бақыланатын сынақтарсыз жасалған. Сондықтан, болашақ зерттеулерде инемен емдеу мен күйдіру спорттық медицина ауруларын емдеудегі тиімділігін одан әрі растау және клиникада жақсырақ қолдану үшін қос соқыр рандомизацияланған бақыланатын сынақтарды үлкен іріктеумен көп орталықты клиникалық бақылаулар жүргізу керек.

Кілт сөздер: ине рефлексті терапия, күйдіру терапиясы, спорттық медицина, емдік әсері, дәстүрлі қытай медицинасы, тендинопатия, миофасцит, сіңір байламдарының зақымдануы.

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Применение и научно-исследовательский прогресс иглоукальвания и прижигательной терапии в спортивной медицине: краткий обзор

Теоретической основой иглоукальвания и прижигания в теоретическом кругу традиционной китайской медицины признается «углубление меридианов, стимулирование кровообращения и устранение застоя крови». В современных медицинских теориях механизм иглоукальвания и прижигания обсуждается как «обезболивание, улучшение микроокружения, влияющее на высвобождение гормонов и воспалительный механизм». Большое количество исследований подтвердило его лечебный эффект, и он стал эффективным методом лечения в спортивной медицине. Проанализированы возможности иглоукальвания и прижигания при лечении заболеваний в спортивной медицине, а также обсуждены клиническая эффективность и механизм применения иглоукальвания и прижигания при лечении тендинопатии, миофасцита, повреждениях связок, периферических нервов, заживления сухожилий и костей и других заболеваний. Хотя иглоукальвание и прижигание широко используются в спортивной медицине, большинство исследований являются ретроспективными и не содержат рандомизированных двойных слепых контролируемых исследований. Следовательно, в будущих исследованиях следует использовать больше рандомизированных двойных слепых исследований для дальнейшего подтверждения эффективности иглоукальвания и прижигания при лечении заболеваний в спортивной медицине посредством многоцентрового клинического наблюдения с большой выборкой, чтобы лучше применять их в клинике.

Ключевые слова: иглорефлексотерапия, термопунктура, спортивная медицина, лечебный эффект, традиционная китайская медицина, тендинопатия, миофасцит, травма связок.

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