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Research Progress in Traditional Chinese Medicine for the Treatment of Knee Osteoarthritis

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Abstract: ***Knee osteoarthritis (KOA) is a disease characterized by degeneration, destruction and bone hyperplasia of knee cartilage, which has gradually become a tough clinical disease in orthopedics because of its high incidence, long treatment time and high disability rate. At present, the clinical treatment of KOA is mainly based on surgery, drug therapy and modern rehabilitation training. Acupuncture (milli needle, electroacupuncture, acupuncture, etc.), moxibustion, massage and traditional exercise therapy (Tai Chi, Baduanjin, etc.) TCM rehabilitation techniques for the treatment of knee osteoarthritis have the characteristics of high safety and definite efficacy. This paper reviews the treatment of KOA and its research progress with traditional Chinese medicine, with the aim of expounding the treatment concept of traditional Chinese medicine, popularizing the treatment technology of traditional Chinese medicine, and providing reference for the prevention and treatment of KOA.***

Keywords: Traditional Chinese medicine treatment, Knee osteoarthritis, Review.

1. Introduction

Knee Osteoarthritis (KOA) is a chronic degenerative disease that seriously affects the quality of life of patients. Epidemiological investigations have shown [1] that the annual prevalence of symptomatic KOA in China has risen to 8.1%. With the acceleration of population aging in China, the prevalence of KOA is increasing year by year, imposing a heavy economic burden on society and families.

In traditional Chinese medicine (TCM), KOA falls into the categories of Bi syndrome, bone Bi, and tendon Bi. The mainstream view among TCM physicians is that this disease is a syndrome of root deficiency and branch excess. TCM proposes that "when healthy qi is stored internally, pathogenic qi cannot invade". Gu Jin Yi Jian (Ancient and Modern Medical Authentication) records that "Bi syndrome arises from internal deficiency of primordial essence and insufficient kidney yang, with invasion of external pathogenic factors that cannot be expelled, stagnating in the channels and collaterals, lodging in the joints, or invading the tendons and bones". Wai Ke Ji Yan Fang (Surgical Verified Prescriptions) states that "a strong kidney ensures vital qi in the bones". Suwen · Bi Lun (Plain Questions · Treatise on Bi Syndrome) points out that "the kidney is a water organ; when water cannot overcome fire, bones wither and marrow becomes deficient, leading to inability to bear weight and the onset of bone pain". Therefore, the etiology and pathogenesis of KOA are considered to be deficiency of the liver and kidney, malnutrition of tendons and bones, vulnerability to invasion by wind-cold-dampness pathogens, resulting in qi-blood stasis and obstruction of channels and collaterals [2]. Accordingly, TCM treatments for KOA mainly focus on tonifying the liver and kidney, dispelling wind-dampness, and activating blood circulation to resolve stasis [3].

Modern medicine regards KOA as a degenerative disease characterized by joint pain, caused by the combined effects of multiple biological and mechanical factors including genetics, metabolism, development, stress imbalance, trauma, and endocrine disorders, which lead to fibrosis, fissuring, and loss of articular cartilage. Its pathological features include degeneration of articular cartilage, sclerosis or cystic degeneration of subchondral bone, osteophyte formation at the joint margins, and synovial lesions [4]. Western medicine treats KOA with nonsteroidal anti-inflammatory drugs, intra-articular injections, arthroscopic surgery, and other interventions to relieve pain and control inflammation. Although these methods can alleviate symptoms, they have certain side effects [5] and are mostly symptomatic treatments; surgical intervention is the main approach for end-stage KOA [6].

TCM and Western medicine each have advantages in the selection of therapeutic regimens for KOA. At present, Western medicine remains the mainstream treatment for KOA. However, with the vigorous development of the traditional Chinese medicine industry in China, TCM therapy for KOA shows great potential for development. This paper reviews the research progress of TCM in the treatment of KOA as follows:

2. Traditional Chinese Medicine Treatment for Knee Osteoarthritis (KOA)

2.1 Oral Administration of Chinese Herbal Medicine

According to the Clinical Practice Guideline for Integrated Traditional Chinese and Western Medicine in the Diagnosis and Treatment of Knee Osteoarthritis issued in 2023 [7], KOA is classified into four syndrome types: qi stagnation and blood stasis type, cold-dampness obstruction type, damp-heat obstruction type, and liver-kidney deficiency type. The guideline emphasizes treatment based on syndrome differentiation and the rational use of oral Chinese herbal decoctions.

A study [8] showed that oral administration of the self-designed Chinese herbal decoction Huoxue Qiangjin Formula for early-stage KOA of qi stagnation and blood stasis type could significantly relieve clinical symptoms, achieve satisfactory long-term efficacy, and improve patients' quality of life ($P < 0.05$).

Zhang et al. [9] conducted a clinical study to evaluate the clinical efficacy of modified Guizhi Shaoyao Zhimu Decoction for acute inflammation during the attack stage of wind-cold-dampness Bi-type KOA. Compared with the celecoxib plus colchicine group, the modified Guizhi Shaoyao Zhimu Decoction group showed significantly better therapeutic effects on acute inflammation, as well as superior control of inflammatory markers and improvement of clinical symptoms ($P < 0.05$).

Wang et al. [10] applied disassembled prescriptions of Wutou Decoction to 116 patients with cold-dampness type rheumatoid arthritis. They found that the traditional Chinese medicine groups (whole Wutou Decoction group, Chuanwu plus Mahuang group) significantly improved clinical symptoms, especially pain and swelling. These two groups also showed certain advantages in reducing anti-CCP antibody, RF, and CRP levels compared with the methotrexate control group, whereas the Wutou Decoction without Chuanwu and Mahuang group showed no obvious benefits.

Wang et al. [11] performed a self-controlled clinical trial to compare the clinical efficacy of oral Simiao Decoction combined with wrist-ankle acupuncture for mild-to-moderate KOA of damp-heat accumulation type. The results demonstrated that this combined treatment could significantly relieve knee pain and improve knee function ($P < 0.05$).

Hou et al. [12] administered Bushen Tongbi Decoction to 90 KOA patients with liver-kidney deficiency. They found that Bushen Tongbi Decoction effectively alleviated knee pain, improved knee dysfunction, and reduced inflammatory levels, with marked therapeutic effects.

Chinese herbal decoctions for KOA not only increase the cure rate and markedly effective rate, but also reduce adverse reactions, and improve VAS score, knee function score, and pain relief time. Therefore, they deserve further clinical promotion and application.

2.2 External Therapy of Traditional Chinese Medicine

TCM external therapy has a long history, with reliable efficacy and high patient acceptance. Li Yue Pian Wen states: “The principle of external therapy is the same as that of internal therapy; the herbs used in external therapy are the same as those in internal therapy… External treatment must follow the logic of internal treatment… although treated externally, it is no different from treating internally.” This statement highly summarizes the theoretical connotation of TCM external therapy.

At present, TCM external therapies for KOA includeChinese herbal iontophoresis, Chinese herbal fumigation and washing, and Chinese herbal wax therapy. According to reports [13], Chinese herbal iontophoresis can effectively regulate the levels of inflammatory factors in KOA patients during treatment, thereby accelerating the functional rehabilitation of the knee joint, with significant clinical efficacy.

Zhao et al. [14] conducted a clinical study in which 82 KOA patients were divided into a Miao medicinal plaster group and a Western medicine flurbiprofen cataplasm group. After treatment, the symptom score and disease severity score in the Miao medicine group were lower than those in the Western medicine group, and the inflammatory factor level was also lower ($P < 0.05$). It can be seen that Miao medicinal Wuteng plaster can improve the therapeutic effect, relieve pain and other symptoms, reduce disease severity, and control inflammatory responses in KOA patients.

Li et al. [15] randomly divided 90 KOA patients into a control group and an observation group (45 cases each). The control group received arthroscopic treatment, while the observation group received additional Chinese herbal fumigation and washing on the basis of arthroscopy. The clinical efficacy and improvement of evaluation indicators in the observation group were significantly better ($P < 0.05$).

Si Hongying divided 94 KOA patients into a Chinese herbal wax therapy plus sodium hyaluronate group and a sodium hyaluronate alone group. The results showed that Chinese herbal wax therapy combined with sodium hyaluronate significantly improved knee function, relieved pain, ensured quality of life, and had good safety, showing high clinical application value.

In recent years, with the development of modern pharmaceutical technology and the emergence of new delivery routes, external Chinese herbal preparations for KOA have become more effective, convenient, and safer [16].

2.3 Acupuncture and Tuina Therapy

Acupuncture and tuina are characteristic and appropriate TCM treatments for KOA. By stimulating specific acupoints, they can improve local microcirculation and bodily functions, thus significantly relieving pain and discomfort.

Li Zhiyu [17] found that compared with conventional treatment alone, warm needle acupuncture further reduced TCM symptom scores ($P < 0.05$) and WOMAC indices ($P < 0.05$), with a higher total effective rate ($P < 0.05$), indicating that warm needle acupuncture can significantly relieve pain in KOA patients.

Under the guidance of treatment based on structural differentiation, Zhang Cheng et al. randomly divided 72 KOA patients into a treatment group and a control group. After treatment, pain was significantly relieved and joint function was comprehensively improved in the treatment group.

Nan et al. [18] selected 96 KOA patients and randomly assigned them to a warm needle acupuncture group or a warm needle acupuncture combined with tuina group. The combination therapy significantly relieved pain, swelling, and discomfort, with obvious therapeutic effects.

Acupuncture and tuina regulate qi and blood, and tonify the liver and kidney. They are widely used in KOA treatment and have the advantages of minimal invasion, high efficacy, and good patient acceptability compared with Western medicine [19].

2.4 Acupotomy Therapy

Acupotomy combines the advantages of TCM acupuncture and Western surgical scalpel. It can significantly improve inflammatory scarring, adhesion, and contracture of soft tissues around the knee joint, restore mechanical stability, improve local blood circulation, activate blood circulation to remove stasis, and alleviate local symptoms.

Zhuang et al. [20] selected 64 KOA patients and randomly divided them into an observation group and a control group. Both groups received oral celecoxib capsules; the control group received functional training alone, while the observation group received acupotomy combined with functional training. After treatment, the combined group showed better pain relief, symptom improvement, and reduction in the ultrasonic shear wave elastic modulus of the quadriceps femoris.

Tao et al. [21] used acupotomy combined with intra-articular PRP injection for KOA patients and found that this combination promoted knee function recovery, which may be related to the regulation of pain mediators, hemorheology, and bone metabolism indicators, indicating that acupotomy is an effective method worthy of clinical promotion.

2.5 Traditional Therapeutic Exercises

Traditional Chinese therapeutic exercises include Tai Chi, Baduanjin, and Wuqinxi. They can improve proprioception and balance, prevent falls, and assist functional rehabilitation in middle-aged and elderly KOA patients, serving as effective complementary therapies.

Exercise therapy based on Tai Chi has been proven effective for chronic pain caused by KOA. Long-term Tai Chi practice improves knee and ankle proprioception, enhances dynamic stability, and reduces fall risk [22].

Related research [23] showed that KOA patients adopt specific postural strategies during Tai Chi Yunshou movement to maintain lateral stability, including reduced ankle dorsiflexion, reduced hip adduction, and increased peak knee flexion moment.

Li et al. [24] added Baduanjin training to KOA treatment and found that it effectively relieved pain, inhibited excessive expression of inflammatory factors, enhanced muscle strength, improved joint stability and function, increased quality of life, and reduced recurrence rate.

Zhang et al. [25] randomly divided 68 KOA patients into an experimental group and a control group. After intervention, Wuqinxi significantly reduced knee pain and improved knee function, as reflected in WOMAC pain scores, 30sCST, TUG, BBS, and isokinetic muscle strength of knee flexion and extension.

Western exercise therapies mainly use muscle strength training and proprioception training to prevent falls. All these approaches improve physical function through strength training and limb movement, meeting the needs of both professional treatment and home exercise [26].

3. Conclusion

KOA is one of the common diseases in orthopedics and traumatology of traditional Chinese medicine. It is also a refractory disease due to the degeneration and irreversible damage of articular cartilage, which greatly affects patients' quality of life. The main purpose of treatment is to relieve pain, improve function, and enhance quality of life.

TCM treatment for KOA emphasizes treatment based on syndrome differentiation, combining holistic and local differentiation, as well as taking into account region, climate, season, and individual constitution. Satisfactory clinical effects have been achieved by combining internal and external therapies for patients with early and middle-stage KOA.

At present, there are still some deficiencies in TCM treatment of KOA: 1) Large deviations in efficacy evaluation, most of which are based on subjective indicators; 2) Some practitioners use a universal prescription without syndrome differentiation, leading to variable efficacy; 3) Lack of high-quality, scientifically rigorous randomized controlled trials.

TCM has unique advantages and great potential in the treatment of KOA. In the future, the integration of traditional Chinese medicine and modern medicine will provide more reliable and effective strategies for patients with KOA.

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