

Research Status of External Treatment of Traditional Chinese Medicine in the Treatment of Knee Osteoarthritis

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Abstract: *Knee osteoarthritis (KOA) is one of the common and frequent clinical diseases, and its pathogenesis is not fully understood. Compared with modern medicine, there are many methods of TCM treatment for KOA, including internal administration of TCM and staining of TCM, smoking of TCM, acupuncture, massage and other external treatment methods of TCM.*

Keywords: Knee osteoarthritis, Knee paralysis, Etiology and pathogenesis, External treatment of traditional Chinese medicine, Research progress.

1. Introduction

Knee osteoarthritis (KOA) is a common and frequent clinical disease, which is clinically manifested by joint pain, swelling, stiffness, deformity, limited activity and other symptoms, and its main pathological changes are deformation and loss of articular cartilage, bone regeneration of articular margins and subchondral bone, fibrosis and thickening of joint capsule [1]. With the intensification of China's aging population and the increase in the proportion of obese population, the prevalence of KOA is also rising [2], which is the main cause of pain, limited activity and even disability in the elderly, and has a negative impact on their physical and mental health [3]. As a result, research into its treatment is receiving increasing attention.

For this disease, Western medicine mostly uses oral non-steroidal anti-inflammatory drugs, intra-articular injection, and surgical treatment, but oral drugs are mostly accompanied by adverse reactions, and the acceptance of patients is low; Although intra-articular injection has the advantage of lower risk of injury, there is insufficient evidence and research to prove its efficacy and safety [4]. For surgical treatment, patients are usually reluctant to accept it because of concerns about the treatment effect, surgical cost, adverse reactions, etc. Therefore, the treatment effect of Western medicine alone is often unsatisfactory, and it is necessary to add Chinese medicine to cooperate with it to play a role.

In contrast, the external treatment of traditional Chinese medicine has the advantages of various methods, simple and easy to implement, significant efficacy, safety and reliability, syndrome differentiation and treatment, and few adverse reactions, which occupies an important position in the treatment of orthopedics and traumatology, and is also a common method for the treatment of KOA in traditional Chinese medicine. This article will review the etiology and pathogenesis of KOA and its external treatment.

2. Etiology and Pathogenesis of Knee Osteoarthritis

Knee osteoarthritis does not have a specific name in traditional Chinese medicine, and can be classified into the categories of "knee paralysis", "paralysis syndrome" and "bone paralysis" according to its clinical manifestations. There are many records of KOA in ancient literature, but most of them appear as symptoms, and there is no specific name for the disease, such as "Su Wen • Treatise on Bone Emptiness": "Knee pain should not be bent or stretched." "Preparing for Emergencies" said: "The Lord of Light can't do knee pain and shin fever." And [5] so on. Knee paralysis is caused by both internal and external causes. Internal causes are the main causes of disease occurrence and development, and external factors are the predisposing factors for disease attacks. "Jisheng Fang Bi" said: "All due to body weakness, the intestines are empty, and they are paralyzed by wind, cold and dampness." The liver is the main reservoir of blood, the tendons in the body, the tendons of the knees, the tendons and bones and the joints; The kidney mainly stores the essence of the marrow, the bone in the body, and the marrow contains the kidney essence, which has the function of congestion and blood; The spleen is the main body of blood, and the muscles are the main limbs. The liver, spleen and kidneys are deficient, the tendons are nourished, the bones are not filled, and the muscles are not real. The patient has always been weak and deficient in external health, resulting in the invasion of wind, cold, dampness and heat, the coagulation of muscles and bones, the blockage of qi and blood, and then the production of phlegm, stasis, depression and other pathological factors, resulting in joint pain and swelling, unfavorable flexion and extension, then it is a paralysis syndrome [6]. Therefore, the main pathogenesis of knee paralysis is the basic and the false.

3. Application of External Treatment of Traditional Chinese Medicine

External treatment of traditional Chinese medicine is an important mode of traditional Chinese medicine therapeutics, and it is also one of the characteristics of traditional Chinese medicine, which is widely used in various clinical

departments, simple and effective, and has attracted great attention from scholars. The external treatment method of traditional Chinese medicine is a method of directly applying traditional Chinese medicine to the local treatment of injuries, and it is also a common method for the treatment of chronic and strain diseases in orthopedics and traumatology. Nowadays, with the advancement of technology, the combination of traditional Chinese medicine and modern technical means has been further developed to treat diseases, such as traditional Chinese medicine iontophoresis, intermediate frequency drug dialysis, etc., or the combination of traditional Chinese medicine external treatment with acupuncture, massage and other external treatment techniques to enhance the efficacy. Modern research has proved that external treatment of traditional Chinese medicine has good clinical efficacy, whether it is applied alone in traditional dosage form, or in combination with Western medicine treatment regimens, or in combination with other physical and traditional Chinese medicine methods.

3.1 Patches

In many external treatment dosage forms of traditional Chinese medicine, the drug preparation is directly attached to the injured area when the patch is used, so that it can exert its medicinal power. Because of its portability, easy operation, economy and practicality, it is widely used, including three types: ointment, plaster and powder. Yu Jie et al. compared the efficacy of knee paralysis external application and voltarin ointment [7] through clinical research, and found that the knee paralysis external application was better than the control group in improving knee pain, range of motion, muscle strength, motor function, etc., indicating that the external application alone has a good effect on relieving patients' pain and improving patients' symptoms. Li Zhiqiang et al. [8] divided 62 patients with stasis and paralysis obstructive KOA into observation group and control group, the control group was treated with flurbiprofen gel plaster, and the observation group was given external application of blood invigorating and swelling ointment, and the preparation method was to mix 13 herbs such as *Radix vulgaris*, *Angelica dahurica*, *Dihuzi*, safflower, continuation, raw gardenia, raw rhubarb, cork, blood exhaustion, borneol, etc., mixed and ground into fine powder, and mixed with petroleum jelly and other excipients to form an external ointment. After 7 days of treatment, the WOMAC index and swelling degree of the two groups were improved compared with the previous group, and the observation group was better than the control group, and the analgesic effect was obvious, and the swelling and dysfunction caused by knee osteoarthritis effusion were improved. Li Tianyang et al. [9] found through animal experiments that osteitis anti-babu agent can delay the progression of KOA by inhibiting the secretion of inflammatory factors, promoting the expression of Bcl-2mRNA and protein, reducing Bax levels and inhibiting the apoptosis of chondrocytes. Wang Zhonghua The rabbits were modeled [10] by injection of papain in the knee joint cavity, and two groups of rabbits were treated with Shi's Death Injury Paste and Luofu Mountain Pain Relief Cream, and the results showed that Shi's Death Injury Plaster treatment could improve the passive range of motion of KOA rabbits, improve the swelling of the knee joint, reduce the expression of NLRP3, IL-1 β and ASC in serum, and reduce

the expression of MMP3, MMP13 and IL-18 in synovial fluid, and the degree of cartilage destruction was still serious. The results indicated that Shi's Death Cream was effective in improving synovial inflammation in KOA rabbits, but had a limited effect on repairing damaged cartilage.

3.2 Rub the Drug

Rubbing medicine was first seen in "Su Wen Blood and Qi Shape Chapter": "The meridians are blocked, the disease is born from inhumanity, and the treatment is to massage the mash." "Mash is a medicinal liquor that is applied in conjunction with massage. Rubbing is to apply tinctures, oils, ointments, etc. directly to the wound, or to use them with pushing and rubbing when performing tendon management techniques, or to apply them when self-massage after hot compress fumigation, which has the effect of dispelling wind and dampness, invigorating blood and relieving pain, and activating tendons [11]. Mei Qijie et al. [12] compared the clinical efficacy of 11 prescriptions of medicinal liquor rubbing combined with oral orecoxib tablets and oral orecoxib tablets alone in the treatment of KOA, and found that the scores of VAS, WOMAC and clinical symptoms of traditional Chinese medicine were better than those before treatment, and the efficacy of the treatment group was better than that of the observation group, indicating that the external treatment method combined with traditional Chinese medicine was more effective than that of Western medicine alone. Zhang Wentao et al. [13] conducted animal experiments and found that Shifang Yaojiu could improve the swelling of the knee joint of the right hind limb and the degree of synovial histopathological damage in rabbits with KOA by reducing the levels of inflammatory factors IL-1 β , TNF- α and PGE2 and down-regulating the TLR4/MyD88/NF- κ B signaling pathway, thereby treating KOA in rabbits.

3.3 Fumigation Wet Dressing

Fumigation wet dressing includes two kinds of fumigation and wet dressing, fumigation is to boil the medicine with water, first fumigate the affected area with hot gas, and then wait for the water temperature to decrease slightly and then soak the affected area with medicated water; Wet compress, also known as staining, is to soak the affected part in the liquid medicine while it is hot or apply the medium containing the liquid medicine to the affected area after removing the slag. With the help of medicine and heat, the two act on the body through the skin and mucous membranes, promoting the dredging of the intestines, the harmony of the veins, and the flow of qi and blood [14]. Wen Shengyue [15] et al. established a KA rabbit model by anterior cruciate ligament transection, and divided it into sham operation group, Shi's fumigation medicine bath group (45°C, 40°C, 35°C) group, pure water bath group (45°C, 40°C, 35°C) group, and voltarin latex group for intervention and treatment, and found that the degree of chondrocyte apoptosis in the Shi's fumigation medicine bath group was lower than that in other intervention groups, and the apoptosis rate was lower than that in other intervention groups, and the mRNA expression of Bax and Caspase-3 was reduced. The mRNA expression of Bcl-2 was increased, which proved that Shi's fumigation herbal bath could effectively inhibit the abnormal apoptosis of articular chondrocytes in KOA rabbit model and delay the destruction

of cartilage at 40°C, which had a significant therapeutic effect on KOA rabbits. Zhang Xubin [16] used Heshuangsan fumigation to treat 34 patients with mild to moderate wind-cold-damp paralysis KOA, and the results showed that VAS score, WOMAC score, SF-36 score and gait analysis score were all lower than those before treatment, indicating that Heshuangsan can help patients relieve pain, improve knee joint function, improve gait and improve quality of life.

3.4 Hot Ironing

Hot ironing is a treatment that uses heat to promote blood circulation through the pores of the skin, enhance the metabolism of the affected area, and accelerate the absorption of drugs into the skin. Thermal urging makes the drug directly reach the affected area, so as to eliminate inflammation, improve intraosseous microcirculation, and reduce intraosseous pressure [17]. Ma Yingrui et al. [18] compared the efficacy of the ironing therapy-active ingredient group with the magic lamp group, the blood-invigorating analgesic ointment group, and the ironing therapy-placebo group, and found that there was no statistical difference in the efficacy of the four groups, but for the evaluation of ISOA and Lequesne osteoarthritis related scales, the ironing therapy-active ingredient group was improved compared with before treatment, and the efficacy was better than that of the other three groups, indicating that traditional Chinese medicine ironing therapy can effectively relieve patients' pain and discomfort symptoms and improve their quality of life. Zhou Yuan et al. [19] based on the theory of phlegm and stasis, the self-simulated soft wound lotion formula was fumigated to the affected areas of KOA patients after steaming heat, and the results showed that the pain and knee function scores were improved after treatment compared with those before treatment, and proposed that the three evils of wind, phlegm and stasis are important pathogenesis factors for the occurrence and development of paralysis syndrome, and phlegm and stasis are often mixed with each other. The view that phlegm is difficult to exhaust without removing phlegm and removing stasis provides a new idea for the syndrome differentiation treatment of local lesions of KOA. Wu Qian et al. used traditional Chinese medicine to adjuvant the treatment of early KOA on [20] the basis of conventional treatment of western medicine, and found that the curative effect was more significant, and the pain and range of motion were more obvious, indicating that the external treatment of traditional Chinese medicine can be used to improve the efficacy on the basis of conventional treatment.

3.5 Combined with Other Treatment Methods

Nowadays, with the advancement of technology, the combination of traditional Chinese medicine and modern technical means has been further developed to treat diseases, such as iontophoresis of traditional Chinese medicine, intermediate frequency drug dialysis and so on, or the combination of external treatment of traditional Chinese medicine with acupuncture, massage and other external treatment techniques to enhance the efficacy. Modern research has proved that external treatment of traditional Chinese medicine has good clinical efficacy, whether it is applied alone in traditional dosage form, or in combination with Western medicine treatment regimens, or in combination

with other physical and traditional Chinese medicine methods. Song Kun [21] treated 35 cases of this disease with a directional dialysis treatment device with a directional dialysis treatment instrument, with 7 cases showing effective effect and 23 effective cases, with a total effective rate of 85.71%, which was better than that of the control group of the commonly used external washing method, indicating that the iontophoresis method had better efficacy than the commonly used external washing method, and the drug properties were easier to play a role. Zhong Lijun et al. [22] treated this disease with Babu ointment combined with acupuncture, and found that the degree of recovery of knee joint function, the reduction of inflammatory factors, and the quality of life score of patients were better than those of the control group treated with acupuncture alone, indicating that the efficacy of external treatment of traditional Chinese medicine combined with acupuncture therapy was better than that of only one therapy. Ouyang Chunbo et al. [23] used Wuwei Osteomorph to extract poison powder for the treatment of KOA, and found that on the basis of the control group, it could effectively alleviate the clinical symptoms such as pain and swelling of KOA patients and improve joint function, indicating that the external treatment of traditional Chinese medicine combined with oral administration of Western medicine has better efficacy than the treatment of conventional Western medicine. Huang Xin et al. treated KOA rabbits [24] by taking Kidney and Huoxue Decoction combined with Ding Sugui hot compress, and found that compared with the positive drug control group and the other two monotherapy groups, the combined group could significantly increase the concentrations of LC3-II and beclin1, enhance the relative expression of LC3-II/LC3-I and beclin1 proteins, and protect the cartilage by increasing the degree of autophagy of chondrocytes, so as to effectively treat KOA. In addition, it was shown that the oral combination of traditional Chinese medicine combined with external treatment had better efficacy than monotherapy and conventional western medicine for external use. Zhang Yitong et al. [25] External application of Simiao Shuangbaisan in the treatment of damp-heat obstructive KOA, the efficacy of the treatment group and the control group was observed, and the content of IL-1 β , IL-6, IL-8 and TNF- α in the joint fluid and elbow venous blood serum of the treated patients was detected by ELISA, and the results showed that the treatment group had better efficacy than the control group, the inflammatory index decreased more obviously, and the content of inflammatory factors in the synovial fluid was higher than that in serum. These results indicated that the external application of Simiao Shuangbaisan had a definite effect on damp-heat obstruction KOA, or it was related to the reduction of inflammatory factors in serum and synovial fluid. Zheng Danping [26] et al. compared the VAS scores and WOMAC scores before and after treatment in the three groups of local rubbing ironing, meridian ironing and Zhuangyi meridian tendon therapy combined with meridian ironing, the results showed that the scores of the three groups were lower than those before treatment, and the efficacy of Zhuangyi meridian tendon therapy combined with meridian rubbing ironing group was better than that of the other two groups, indicating that the external treatment of traditional Chinese medicine combined with manual relaxation effect was better. Yang Zhenxu [27] Through clinical comparison in the treatment of cold-damp paralysis obstructive KOA, the treatment group was

self-simulated walking decoction fumigation and hot compress knee joint pain points and corresponding acupuncture points, and the group formula was 10g of Chuanwu Wu, 10g of Caowu Wu, 20g of Atractylodes atractylodes, 20g of Poria cocos, 10g of frankincense, 10g of myrrh, 10g of stretching tendon grass, 20g of bone crushing, 15g of Saponaria sinensis, 10g of Sichuan Xuanduan, and 10g of Huai Oxknee. The control group was coated with diclofenac diethylamine latex and gently rubbed the pain points and corresponding acupuncture points of the knee joint. The results showed that the VAS score and WOMAC score of the two groups were lower than those before treatment, and the difference between the two groups after treatment was statistically significant. The results indicated that the two treatments could reduce joint pain, stiffness and dysfunction in patients, and the efficacy of the treatment group was better than that of the control group.

4. Summary and Outlook

The etiology of KOA is complex, its pathogenesis has not been fully elucidated, and there is a lack of effective treatment, which can only alleviate symptoms and delay disease progression. Modern medical treatment of KOA is mainly based on drugs and surgery, and the gastrointestinal reaction of drug treatment is large and prone to liver and kidney damage, and patients have poor long-term medication compliance, while surgical treatment has high risk, trauma, high cost, and poor long-term efficacy. Guided by the basic theories of traditional Chinese medicine, the external treatment method of traditional Chinese medicine gives full play to the characteristics and advantages of traditional Chinese medicine, and creates a variety of external treatment methods with definite curative effects. It has also achieved good results in the treatment of KOA. In recent years, through continuous improvement and innovation, the treatment method of traditional Chinese medicine has developed rapidly, and has also become the focus of active research by the majority of traditional Chinese medicine practitioners. However, there are also many deficiencies in the external treatment of traditional Chinese medicine, and the current KOA lacks objective evidence for syndrome differentiation and unified diagnosis and treatment standards, and lacks basic research and theoretical basis. Therefore, it will be the goal and direction of our exploration and efforts to explore the scientific basis of TCM external treatment, explore the advantages of TCM external treatment, give full play to the treatment characteristics of TCM, and further reduce the pain and economic burden of KOA patients.

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