

Research on the External Treatment of Knee Osteoarthritis with Traditional Chinese Medicine Based on the Theory of "Bones in a Good Position and Soft Tendons"

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Abstract: Knee osteoarthritis is a common chronic joint disease characterized by the destruction, degeneration and bone hyperplasia of articular cartilage, which seriously threatens human health. Traditional Chinese medicine believes that it belongs to the category of "body obstruction disease" and "skeletal meridian obstruction". Due to the obstruction of meridians, qi stagnation and blood stasis, the muscles and meridians lose nutrients, and external evil spirits enter the affected area and mix with blood stasis. The early lesions are in the tendons, and then from the tendons to the bones, the tendons and bones develop together. The external treatment of traditional Chinese medicine for KOA can promote the circulation of Qi and blood in the body, improve the stability of muscles and bones, restore the normal "Bones in a good position and soft tendons", and thereby restore knee joint function.

Keywords: Knee osteoarthritis; "Bones in a good position and soft tendons"; External treatment with traditional Chinese medicine

1. Introduction

Knee osteoarthritis is a common and frequently-occurring disease in middle-aged and elderly people. Its main clinical manifestations are local pain, swelling, and snapping caused by joint degeneration and limited movement [1]. In severe cases, it may lead to joint deformity or even high disability [2]. KOA is characterized by progressive destruction such as subchondral bone degeneration, wear, and periarticular hyperplasia, subchondral bone sclerosis, cystic lesions, and varying degrees of inflammatory lesions of the synovium as its main pathological characteristics [3]. Epidemiology shows that approximately 15% of the world's population is troubled by KOA [4], which brings a huge economic burden to society and families [5]. The current incidence rate in China is 18%, 9% to 13% in males, and 16% to 23% in females. The incidence rate in women is significantly higher than that in males [6]. At the same time, the disease also has regional differences. The incidence rates in the northwest and southwest regions are 10.8% and 13.7%, respectively, which are higher than the 5.4% and 5.5% in North China and the eastern coast. Moreover, the incidence rate in rural areas is much higher than that in cities [7]. KOA begins to occur in middle age, and the incidence gradually increases with age. The incidence rate is 10% to 17% over the age of 40, 50% over the age of 65, and as high as 80% over the age of 75 [8]. As society gradually ages, it can be predicted that knee osteoarthritis will bring greater challenges to human health [9] and will become a medical health issue that must be paid attention to. At present, Western medicine has many disadvantages in its treatment methods, such as intolerance to surgery, complications and inflammation, and adverse reactions to oral and topical drugs [10]. In the context of the rapid development of traditional Chinese medicine, traditional Chinese medicine therapy, especially external therapy, has been increasingly accepted by patients for its advantages of syndrome differentiation, diverse techniques, low price and fewer side effects [11], and has become a hot spot in KOA research. This paper explores the pathogenesis of knee osteoarthritis and the external treatment methods of traditional Chinese medicine based on the theory of "Bones in a good position and soft tendons", to provide reference and guidance for theoretical and clinical research.

2. Exploring the Pathogenesis of KOA Based on the theory of " Bones in a good position and soft tendons "

Traditional Chinese medicine has long had mature understanding and diagnosis and treatment theory of KOA. Traditional Chinese medicine theory believes that KOA belongs to the category of "knee obstruction", that is, "tendon obstruction" and "bone obstruction". According to the modern anatomical meaning, "tendons" can be classified as muscles, tendons, fascia, ligaments, nerves and other tissues attached to bones [12]. "Bone" includes bones and joints, which are the main structure of the human body [13]. The knee joint is the largest joint in the human body and an important channel for the transportation of Qi and blood, maintaining the stability of the human body structure. "Block" means "closure", which means that the meridians and Qi and blood are blocked. KOA is a "knee obstruction". The disease covers the entire joint and soft tissue, which is a disease of the muscles and bones. As stated in the "Su Wen Bi Lun", "If blocked in the tendons, it will not bend or extend, and if blocked in the bones, it will be heavy" [14]. It can be seen that "muscle blockage" is a necessary stage, and "bone blockage" is the final manifestation. Because muscles and bones are closely related to qi and blood, and qi and blood are the material basis of muscles and bones, "Su Wen Sheng Qi Tong Tian Lun" puts forward the theory that "the bones are straight and the muscles are soft, and qi and blood can flow", which shows that normal functions of muscles and bones and smooth qi and blood in meridians are the basis for maintaining normal life activities. Pingle's bone-setting theory believes that the development of KOA is a process in which the muscles lose their softness and the bones lose their alignment, forming " muscle blockage and bone dislocation " [15]. When the tendons are soft, irregular, not in grooves, etc., the spatial position and physiological function of the tendons are abnormal, resulting in compensatory osteophyte hyperplasia and tender tendon lesions such as cords and nodules [16], which is also a symptom of poor circulation of meridians and qi and blood [17]. "Lingshu Meridians" says, "The bones are the trunk...the tendons are the rigidity...the tendons bind the bones and sharpen the joints." Because the tendons have the function of binding the joints, "the big tendons connect the joints, and the small tendons are attached to the bones. " Under physiological conditions, "tendons" and "bones" must maintain a balanced and stable state to "balance the tendons and bones, straighten the bones and soften the tendons" [18], and jointly maintain the normal function of joint functional activities. When the tendons lose their normal attachment and connection functions, the tendons are unable to bind the bones, resulting in local qi stagnation and blood stasis, and the blood does not flow to the tendons, causing the tendons to lose their attachments, which further accelerates cartilage degeneration, leading to the pathological phenomenon of "tendons out of grooves and bones misaligned" [19]. Subsequently, displacement occurs between joints, cartilage is damaged [20], and joint stress occurs abnormally, ultimately leading to various symptoms of knee osteoarthritis. Modern anatomy has found that in order for the knee joint to maintain normal function, the femur, patella, and tibia of the knee joint must be in a normal anatomical structure, and the balance of the soft tissue around the knee joint plays a vital role in the stability of the knee joint. The stability of the knee joint is also the goal of treating KOA, which is completely consistent with the connotation of the theory of "Bones in a good position and soft tendons" of traditional Chinese medicine and also verifies the ancients' forward-looking understanding of the disease.

3. External Traditional Chinese Medicine Treatment for KOA

There are internal and external treatments for knee osteoarthritis. The internal treatments are mainly traditional Chinese medicine decoctions and Chinese patent medicines. Treatment is based on syndrome differentiation, and different drugs are used to nourish the liver and kidneys, add lean marrow, activate dysmenorrhea, activate blood circulation, relieve pain, etc. However, because KOA patients are generally older and have poor spleen and stomach functions, they have side effects such as poor absorption and utilization of oral drugs and adverse gastrointestinal reactions. The external treatment method is simple and easy to implement and operates directly on the diseased area to achieve a direct curative effect without causing unnecessary drug side effects [21]. Therefore, it is more recognized by patients in clinical practice. Contemporary experimental research has also confirmed that external treatment with traditional Chinese medicine can adjust biomechanics, inhibit the release of inflammatory factors, and slow down chondrocyte apoptosis [22], thereby achieving " Bones in a good position and soft tendons " and improving KOA-related symptoms, which is worthy of clinical promotion and use.

3.1 Massage Physiotherapy Tendons

Traditional Chinese medicine techniques are one of the most traditional methods for treating "bone

paralysis", with rapid and significant effects. Traditional Chinese medicine bone-setting and tendon-regulating techniques are particularly effective for patients with mid-to-late stage osteoarthritis. Because the intrinsic pathogenesis of KOA is a state of "muscle-bone imbalance" caused by weak muscles and bone abnormalities, and "muscles bind bones and bones stretch muscles" [23], "muscle blockage" does not necessarily affect the bones. In contrast, "bone blockage" must reach the tendons [24]. In patients with middle and late stages of the disease, the muscles and bones share the same disease, so the treatment should follow the principle of "paying equal attention to the muscles and bones, putting the muscles first" [25]. First, soften and regulate the muscles to activate blood circulation and dredge meridians, improve local blood circulation in joints, loosen soft tissues, reduce intra-articular pressure, accelerate cartilage metabolism, and slow down the degeneration of articular cartilage [26]. After the tendon injury has recovered to a certain extent, the misaligned tendons and bones can be reset in a short time through manual bone setting [27], thereby driving the soft tissues attached to the bones to return to normal functions, allowing Qi and blood to flow smoothly, and reappearing the "Bones in a good position and soft tendons" state, restoring normal function of bones and joints. Massage therapy involves massaging, pinching, rolling, and rocking the area around the knee patella and acupoints, which can improve blood circulation, promote the absorption and metabolism of inflammatory factors, and instantly relieve pain symptoms [28], which also has certain curative effects on KOA.

3.2 Acupuncture Therapy

Acupuncture therapy is also one of the oldest and most widely used traditional Chinese medicine methods. Its treatment of KOA is based on the meridian theory, selecting acupoints along the meridians and inserting filiform needles into the human body to dredge the meridians and qi and blood, so that yin and yang, Yingwei can be reconciled so that wind, cold, dampness, and heat evils have nothing to rely on, which has the effect of reconciling yin and yang, reducing swelling and relieving pain [29]. Acupuncture therapy is developing rapidly. Currently, based on conventional acupuncture, warm acupuncture, electro-acupuncture, fire acupuncture and other therapies are derived to target different symptoms. Warming acupuncture is a therapy that combines acupuncture and moxibustion, which are the effects of warming the meridians, dispersing cold, unblocking collaterals and relieving pain. Fire acupuncture involves heating the needle red and inserting it into the acupoint, which can stimulate Yang Qi, regulate the internal organs, and promote the circulation of Qi and blood [30]. Electroacupuncture is based on filiform acupuncture, using an electroacupuncture machine to provide low-frequency pulse current, which increases the amount of stimulation compared with acupuncture alone, strengthens the sensitivity of the meridians, can relatively shorten the treatment time, and improves the clinical effect [31]. Modern medical experiments analyze from the molecular biology level and believe that acupuncture can block the conduction of neurotransmitter receptors and inhibit the pain centre of the cerebral cortex, thereby improving joint pain symptoms [32].

3.3 Needle-knife Therapy

Needle-knife therapy is a treatment method that combines acupuncture with a modern surgical scalpel, which is the development and innovation of acupuncture therapy. Half a century of clinical application has confirmed its advantages of good curative effect, less trauma, few adverse reactions and easy recovery. The pathogenesis of KOA is the imbalance of muscles and bones in the knee joint. The clinical manifestations are "tendon joints" with adhesion, scar and contracture of joint soft tissue [33], which increase the tension of the local soft tissues and shift the alignment of the tibia and femur, further increasing the tension. It causes wear and tear on the joint surface and aggravates the progression of the disease. Needle-knife therapy is a minimally invasive surgery. Before the operation, the positioning must be based on the relevant knowledge of "Chinese Meridian Science" [34], and the tender points, high tension points, hard knots and other tendon nodes in the painful area must be palpated. Make a mark as a treatment point after the needle tip touches the bone surface, the skin is broken with a quick injection, the needle tip is slightly stepped back, and the longitudinal and transverse stripping is performed lightly. Through the release of soft tissue, the stress concentration point is relieved, and the mechanical balance of the knee is restored [35], thus improving the joint mobility function. Modern medical research has proven that needle-knife therapy is related to four aspects of human biomechanics: molecular biology, hemodynamics and central analgesic mechanisms. It can reduce joint inflammation, improve blood circulation, and regulate the conduction of relevant signal pathways. Inhibit the release of related neurotransmitters at the spinal cord level and adjust the biomechanical balance of the knee joint, thereby alleviating the clinical symptoms related to KOA [36].

3.4 Moxibustion Therapy

Moxibustion, like acupuncture, is also a commonly used treatment method in traditional Chinese medicine, which is popular among patients for its versatile, simple and cost-effective techniques. Mugwort leaves have the medicinal properties of stimulating menstruation, activating collaterals, regulating qi and promoting blood flow, and removing dampness and repelling cold [37]. Moxibustion therapy ignites moxa and then places it on the body surface for cauterization and ironing. With the help of fire, the warming effect of moxa can reach the body directly, which can significantly improve the blood circulation around the knee joint and reduce pain and stiffness symptoms. Experiments have found that the mechanism of moxibustion therapy in treating KOA may be related to inhibiting the activation and expression of cyclooxygenase [38], and high levels of inducible cyclooxygenase are the main cause of knee joint pain and cartilage destruction. After moxibustion treatment, the concentration of inducible cyclooxygenase in peripheral blood was significantly reduced [39]. Moxibustion has been continuously improved and innovated in long-term clinical practice. According to differences in the selection of mugwort, the production of moxa pillars, and moxibustion techniques, wheat grain moxibustion, essence moxibustion, heat-sensitive moxibustion, thunder-fire moxibustion, suspension moxibustion, etc. have been developed. There are various forms, such as object-partition moxibustion, ginger-partition moxibustion, herb-partition moxibustion, etc. Moxibustion is often combined with traditional Chinese medicine, acupuncture, and massage in treating KOA to make up for the shortcomings of a single therapy, and the effect is more significant [40].

3.5 Chinese Medicine Fumigation

The traditional Chinese medicine fumigation and washing method is used to treat KOA by boiling drugs that have the effects of activating blood circulation, removing blood stasis, strengthening muscles and bones, such as safflower, myrrh, frankincense, Poria cocos, lycopodium clavatum, Boneless Grass, etc., and boil them into a decoction to treat the bones and joints. Fumigation or atomization [41], heat can dilate the tiny blood vessels in the knees, accelerate blood and lymph circulation, dredge meridians [42], promote metabolism and inflammation absorption, and relieve muscle and bone pain. Relevant studies have shown that the reason why fumigation and washing reduce pain may be related to the reduction of inflammatory factors such as nuclear factor kappa B (NF- κ B), cartilage oligomeric matrix protein (COMP), and vascular endothelial growth factor (VEGF) in the body. Therefore, it can protect chondrocytes and slow down the rate of cartilage destruction [43].

3.6 Chinese Medicine Patch

The traditional Chinese medicine application method is also called the "paste method" and "paster method", and it has a wide audience due to its convenient operation. The method is to make a patch or paste of a Chinese medicine prescription and apply it to a specific point or diseased area. Thus, the drug effect can act on the affected area slowly and persistently, promote blood circulation and blood stasis, strengthen tendons and bones, regulate immunity, improve local tissue nutrition, promote tissue fluid absorption and metabolism, and have anti-inflammatory and analgesic effects. Therefore, modern studies believe that this is because the drug ingredients participate in the oxidative stress response in the body, alleviating the pain and swelling symptoms [44].

3.7 Wet Compress of Traditional Chinese Medicine

Wet compress of traditional Chinese medicine is also a common therapy method, which has the advantages of simple operation, wide application, and low cost. The medicine is boiled and made into a soup. While the medicine is warm, apply it to the knee joint with gauze, which allows the medicine ingredients to penetrate directly into the lesion through local penetration, which can relieve pain, promote damage repair, and significantly improve various indicators of arthritis. Relevant studies have found that the therapeutic effect of a wet compress of traditional Chinese medicine is achieved by regulating the expression levels of inflammatory factors such as BMP-2, cylinD1, c-myc, mRNA, MMP-3, and MMP-1 [45]. The wet compress of traditional Chinese medicine for acne has the advantages of high drug availability and no adverse reactions [46]. The treatment process is highly comfortable and easy for patients to accept.

With the changes in the modern lifestyle and the arrival of ageing, the number of people affected by KOA will increase and become younger and younger. How to find safer, more effective and cheaper

treatments has become a topic before us. The theory of "Bones in a good position and soft tendons" is closely related to the occurrence and development of knee osteoarthritis. By improving the functions of tendons and bones and the stable state between them, the purpose of improving clinical symptoms and knee joint function can be achieved. The external treatment method of traditional Chinese medicine is in line with the concept of paying equal attention to the muscles and bones. Different treatments have the same goal, and they can all play the role of strengthening the muscles and bones, dredging the meridians and unblocking the meridians. There are many types of them, each with its own strengths, and rich experience has been accumulated in long-term clinical practice. It has unique advantages, including low cost, rich choices, and few side effects. However, there is a lack of individualized consideration of the patient's syndrome type and constitution, and some therapies are relevant to the level of the operator. It is difficult to achieve standardization of treatment, and the efficacy is not accurate enough. In the future, with a deeper understanding of the pathogenesis of knee osteoarthritis, combining the thinking of traditional Chinese medicine with the advanced technology of modern medicine, it is hoped to continuously improve and innovate the external treatment method of traditional Chinese medicine, adapt it to different people, and standardize the process to make the effect more reliable and benefit the majority of patients.

4. Conclusion

Knee osteoarthritis is a common disease that often occurs in middle-aged and older people. According to epidemiology, KOA affects approximately 15% of the world's population, causing a substantial economic burden on societies and families. The main clinical symptoms are localized pain, swelling, and clicking caused by joint degeneration and restriction of movement. KOA is characterized by subchondral bone degeneration, wear and tear, and progressive destruction, such as periarticular hyperplasia, subchondral bone sclerosis, cystic lesions, and various degrees of synovial inflammatory lesions as the main pathological features. With the gradual aging of society, knee osteoarthritis will bring more significant challenges to human health. This paper introduces the external traditional Chinese medicine treatment for KOA, including massage physiotherapy tendons, acupuncture therapy, needle-knife therapy, moxibustion therapy, Chinese medicine fumigation, Chinese medicine patch, and wet compress of traditional Chinese medicine. To sum up, this study is of great significance to Chinese medicine and promotes the medical industry and human health.

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