

# Progress in the Treatment of Degenerative Knee Osteoarthritis with Traditional Chinese and Western Medicine

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**Abstract** The current treatment effect for degenerative knee osteoarthritis is only short-term and lacks long-term effectiveness research. Using novel treatment methods to address degenerative knee osteoarthritis, we aim to achieve long-term effects and avoid potential knee replacement surgery in the later stages of arthritis. This article searches CNKI, WEB OF SCIENCE, Google Scholar, and Wanfang Database for literature from 2017 to 2022, using keywords to obtain information on the etiology, pathogenesis, treatment methods, and clinical outcomes of degenerative knee osteoarthritis. Excluding animal studies, irrelevant to degenerative knee osteoarthritis, abstracts only, and repetitive documents, the selected documents were published in core journals. Relevant representative documents were collected for summary and analysis. This study analyzes relevant clinical literature on the treatment of degenerative knee osteoarthritis in the past five years to optimize better treatment options.

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The knee joint is composed of the femur and tibia bound by ligaments and muscles. A joint cavity is formed between the two bones by the knee joint capsule. The inner wall of the joint capsule is a synovial membrane, which is responsible for secreting synovial fluid to lubricate the cartilage on the two bones in the cavity and maintain their separation [1]. The joint capsule is covered by muscles, which protect and stabilize the structure of the knee joint and provide the ability for the knee joint to bend and extend.

Degenerative knee osteoarthritis (KOA) is an inflammation of the knee joint. Due to long-term unbalanced tension of the muscles attached around the knee joint, the structural position of the knee joint is gradually affected, causing changes in the pressure within the knee joint capsule. The function of the synovial membrane in secreting synovial fluid is affected, making it impossible to keep the femur and tibia separated and lubricated. Consequently, the cartilage rubs and damages each other, forming degenerative knee osteoarthritis [2].

Degenerative knee osteoarthritis is a common and frequently occurring disease. Its inflammation is accompanied by symptoms such as redness, swelling, pain, and stiffness, causing inconvenience and pain for patients when moving. Long-term difficulty in walking also reduces patients' quality of life and affects their physical and mental health [3].

Currently, Chinese and Western medicine have many insights into the pathogenesis of degenerative knee osteoarthritis, and different methods are used to treat it. However, after comparing the results of many statistically significant literature studies with the results of clinical practice, knee joint replacement surgery remains an option for late-stage degenerative knee osteoarthritis, causing harm to patients' physical and mental health and financial losses. In the white paper "The 2020 American Joint Replacement Registry (AJRR)" [4] published in May 2022, it was reported that between 2012 and 2019, a total of more than 1,897,050 hip joints (33.3%) and knee joints were replaced (53.0%).

Degenerative knee osteoarthritis usually occurs between the ages of 45 and 64 and is more common in women. The overall trend is becoming younger [5]. The current main treatment methods only show short-term effects. It is necessary to re-understand the cause, development process, treatment ideas, and methods of degenerative knee osteoarthritis to develop better treatment plans, avoid possible knee replacement surgery in the later stages, and improve patients' quality of life and physical and mental health.

## **1. Western Medicine's Understanding and Treatment of Degenerative Knee Osteoarthritis**

### **1.1 Western Medicine's Understanding**

Western medicine believes that the external factors that cause degenerative knee osteoarthritis include accidents, sports injuries, gender, and obesity [6]. Other factors, such as changes in hip abductor muscle strength and abnormal local mechanical stress on the knee joint, also affect the formation of knee joints and degenerative knee osteoarthritis. To diagnose the atypical clinical symptoms of early knee osteoarthritis, other diagnostic techniques are needed, such as laboratory tests, imaging techniques, and arthroscopy. After diagnosis, the clinician needs to take targeted measures to treat the patient in a timely manner based on the examination results [7].

Modern research has found that increased intraosseous pressure caused by blood circulation disorders, cytokines that mediate inflammatory reactions and participate in immune activities, free radical damage to cartilage, the body's self-produced multifunctional biological molecule nitric oxide that affects cartilage repair, and matrix metalloproteinases (MMPs) that cause chondrocyte necrosis and apoptosis can all contribute to the development of knee osteoarthritis. However, studies have also found that even after these factors are removed, knee osteoarthritis continues to occur [8].

Clinical symptoms of degenerative knee osteoarthritis include joint pain and swelling, especially after excessive activity or when walking up and down stairs or standing up from sitting for a long time. Joint stiffness in the morning, which improves after a period of activity, and worsening pain at night are common. There may be noises when the knee joint moves. The knee joint may become deformed and spasmodic, such as with O-shaped legs and the inability to straighten the joint. X-ray examinations can show narrowing and deformation of the joint surface, bone spur hyperplasia, sclerosis under the cartilage, and degenerative cyst formation [9].

## **1.2 Western Medicine Treatments**

### **1.2.1 Non-Drug, Non-Surgical Treatments**

Reduce the frequency of knee joint use, avoid overuse, and get more rest. The American Academy of Orthopaedic Surgeons recommends that people with a BMI of 25 or above should control their weight to avoid the wear and tear caused by long-term load on the body. Physical therapy, aerobic exercise, and low-impact exercise can improve local blood circulation, reduce inflammatory responses, promote the absorption of synovial fluid, reduce knee muscle spasms, reduce the internal pressure of the knee joint cavity, and help repair cartilage [10].

Wang Ruihan et al. [11] stated that platelet-rich plasma is a blood product containing a high concentration of platelets that can release bioactive substances, including a variety of growth factors, thereby promoting wound healing and other functions. Numerous studies have shown that platelet-rich plasma can improve degenerative knee osteoarthritis, promote knee cartilage regeneration, and improve clinical symptoms of patients. It is particularly suitable for patients with early osteoarthritis.

USLU et al. [12] indicated that serum therapy improved the symptoms of degenerative knee osteoarthritis within 6 months after treatment, while the effective period of steroid injection was shorter than that of serum therapy. Zhang Wenbo and Zhao Dongbao [13] indicated that intra-articular injection of mononuclear cell preparations is a new trend in the treatment of osteoarthritis (OA) and has shown good clinical effects. Exploring the clinical research and molecular mechanisms of exosomes and peripheral blood MNCs in the treatment of OA is a new entry point for research.

### **1.2.2 Drug Treatment**

Western medicine mainly focuses on anti-inflammatory and analgesic effects in the knee joint for drug treatment of degenerative knee osteoarthritis [14]. The analgesic effect of hormones is rapid and significant, but it easily causes side effects such as gastrointestinal bleeding, thinning of the skin, osteoporosis, and difficulty in wound healing, and may even aggravate the severity of chronic diseases such as hypertension and diabetes. Non-steroidal anti-inflammatory drugs are also often used for pain relief and anti-inflammatory treatment. However, long-term use is prone to side effects such as peptic ulcers, lower limb edema, and kidney damage.

Anti-inflammatory patches can be applied to the surface of the knee joint to relieve inflammation and pain. Glucosamine can stimulate the synthesis of glycoproteins by chondrocytes in the joint and has anti-inflammatory and analgesic effects, but it does not have the side effects of non-steroidal anti-inflammatory drugs. Hyaluronic acid preparations can replenish the loss of synovial fluid in the knee joint cavity, provide lubrication for cartilage, separate the two bones in the knee, spread nutrients in the knee

joint cavity, nourish the tissues in the joint cavity, improve joint mobility, and relieve inflammation and pain [15].

Tang Guoneng et al. [16] stated that hyaluronic acid is the main component of cartilage matrix and knee joint fluid. Injecting hyaluronic acid into the knee joint cavity can relieve arthritis pain, improve joint function, protect cartilage, promote the synthesis of proteoglycans and glycosaminoglycans, resist inflammation, and improve subchondral bone and mechanical properties. Zhang Ling et al. [17] stated that autologous chondrocyte transplantation is an effective method for treating tibial or femoral cartilage defects, but problems such as coronal force misalignment, ligament laxity, and meniscus injury must be resolved first.

### **1.2.3 Surgical Treatment**

Surgical treatment is an option for the late stage of degenerative knee osteoarthritis in Western medicine. There are many surgical methods, including arthroscopic surgery, osteotomy correction surgery, and artificial joint replacement surgery. If there is just slight wear of the cartilage, loose objects in the joint cavity, and inflammation of the synovial membrane, arthroscopy can be used to clean the joint. Osteotomy correction surgery is performed to correct the deformed bone so that the damaged cartilage can rest. If the knee joint is severely degenerated and the articular cartilage is completely destroyed, artificial joint replacement surgery can be considered [18].

Yan Yifeng et al. [19] found that the active surgical treatment of KOA has a good effect, but prosthesis positioning is challenging and the operation is difficult. Other therapies for KOA that have been recently studied in clinical settings include genicular nerve radiofrequency ablation, robot-assisted knee replacement, biological therapy, laser therapy, platelet-derived plasma (PRP), and mesenchymal stem cells (MSC), among others.

## **2. Understanding and Treatment of Degenerative Knee Osteoarthritis in Traditional Chinese Medicine**

### **2.1 Understanding of Traditional Chinese Medicine**

Traditional Chinese medicine's understanding of degenerative knee osteoarthritis is that the internal factor is the poor flow of qi and blood, which stagnates in the knee joints and causes fever, swelling, pain, stiffness, difficulty in bending and stretching, etc., which belongs to the category of arthralgia. Traditional Chinese medicine believes that the liver governs the tendons and the kidney governs the bones. The tendons and bones rely on the supply of essence, blood, body fluids, and the warmth of yang to function normally. Due to the deficiency of the liver, spleen, and kidney, the imbalance of yin and yang, and the deficiency of qi and blood, lead to the malnutrition of tendons and bones. "Suwen" says: "The main tendons bind the bones and facilitate the organs." "Yijing" says: "The tendons are the meridians of the human body, outside the joints and inside the muscles." Tendons

are attached to bones, bones are connected to tendons, muscles and tendons are on the outside, and bones are on the inside [20].

The external factor is described in "Suwen Bi Lun": "The three qi of wind, cold, and dampness come together and form arthralgia." Arthralgia is usually divided into:

- Walking arthralgia (wind arthralgia): difficulty walking;
- Painful arthralgia (cold arthralgia): pain due to blockage;
- Damp arthralgia (wet arthralgia): joint swelling; and
- Hot arthralgia (wind, cold, and damp arthralgia).

The joints of the limbs are often exposed to the natural environment. The meridians and tendons outside are damaged first, and the cartilage, subchondral bone, and ligaments inside the joints also lose the nourishment of qi and blood and become loose and damaged. The uneven distribution of stress inside the knee joint causes the lower limb weight-bearing line to deviate from the normal position, the joint surface becomes narrow, causing knee valgus deformity and destruction of the basic structure of articular cartilage, and eventually leading to degenerative knee osteoarthritis [21].

## **2.2 Treatment of Traditional Chinese Medicine**

The diagnosis of degenerative knee osteoarthritis in traditional Chinese medicine includes symptoms such as soreness of the waist and knees, fear of cold limbs, pale red tongue, and a deep and weak pulse or fine pulse. The main treatment methods of traditional Chinese medicine include Chinese medicine, acupuncture, moxibustion, and massage. Chinese medicine treatment aims to nourish the liver and kidneys, relax the tendons, and relieve pain. Commonly used acupuncture points are Ashi points, local meridian points, Shenshu points, and Guanyuan points. They soften the liver and nourish blood, nourish yin and strengthen tendons, and enhance the strength of the lower muscles to restore the function of "the main tendons bind the bones and benefit the organs" [22].

Xie Pingjin et al. [23] stated in the article "The effect of the trinity of bones, tendons, and muscles on the prevention and treatment of degenerative knee osteoarthritis" that the etiology and pathogenesis of degenerative knee osteoarthritis in traditional Chinese medicine are: internally, it is attributed to the deficiency of the liver, spleen, and kidney, imbalance of yin and yang, insufficient qi and blood, and malnutrition of tendons and bones; externally, it is attributed to the invasion of external evils such as wind, cold, and dampness. "Suwen" points out: The ancestral tendons are responsible for binding bones and facilitating organs. If the tendons do not bind bones, the joints will be affected, and then the cartilage, ligaments, and muscles of the joints will be damaged.

According to the research of Wang et al. [24], the mechanism of the four methods of traditional Chinese medicine for the treatment of degenerative knee osteoarthritis, acupuncture, moxibustion, Chinese medicine, and massage, is as follows:

- Acupuncture: can inhibit the excessive expression of inflammatory factors such as interleukin-1 (IL-1) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), effectively reducing the inflammatory response in bones and joints.
- Moxibustion: can improve the inflammatory response and inhibit the inflammatory response by modulating the NF- $\kappa$ B signaling pathway.
- Cyclooxygenase 2 (COX-2): destroys cartilage cells and produces pain, but reducing inflammatory factors such as interleukin-1 and tumor necrosis factor- $\alpha$  helps degenerative knee osteoarthritis resist injury and improve function [25].

Li Hui et al. [26] found that the mechanism of action of effective ingredients of traditional Chinese medicine in preventing and treating osteoarthritis mainly includes reducing the production of inflammatory factors, alleviating oxidative stress, inhibiting matrix-degrading enzymes, regulating cartilage cell metabolism, and regulating related signal pathways. Experiments have confirmed that massage can alleviate the effects of RANTES and MCP-1, thereby helping the recovery of arthritis [27].

### **3. Literature Search Data Source**

Search CNKI, Web of Science, Google Scholar, and Wanfang database for literature from 2017 to 2022 using relevant keywords to obtain clinical research literature on the etiology, pathogenesis, treatment, and follow-up results of degenerative knee osteoarthritis. Exclude animal experiments, literature unrelated to the knee joint, only abstracts, and repetitive literature. Select literature published in core journals, and then read them one by one to collect 50 relevant representative literatures for summary and analysis.

#### **Criteria for Literature Selection**

##### **Inclusion Criteria:**

1. Literature on the basic theory and treatment methods of degenerative knee osteoarthritis.
2. Clinical research on the treatment of degenerative knee osteoarthritis.
3. Relevant literature with representative and different treatment methods.

##### **Exclusion Criteria:**

1. Animal experiments.
2. Non-journal literature.
3. Literature unrelated to the knee joint.
4. Only abstracts and repetitive literature.

**Quality Assessment:** Collect literature from the past five years that meet the inclusion criteria. Analyze and evaluate traditional Chinese medicine treatment and Western medicine treatment of degenerative knee osteoarthritis.

#### 4. Results

According to the collected literature, in the initial clinical studies of traditional Chinese and Western medicine for the treatment of degenerative knee osteoarthritis, the efficacy of the observation group was better than that of the control group, and the difference in efficacy was statistically significant. However, there was a lack of long-term follow-up comparison.

Liu et al. [28] used hyaluronic acid injection into the knee joint cavity in 94 cases out of 412 total samples and steroid injection in 318 cases. It showed that the symptoms improved before and after the study, and the difference was statistically significant ( $P < 0.05$ ). However, the follow-up after two years showed that there was no substantial help for degenerative knee osteoarthritis.

Song Yongping et al. [29] used 150 total samples, with 75 cases of conventional drugs and rehabilitation exercise program + active exercise therapy, and 75 cases of conventional drugs and rehabilitation exercise program. It showed that after one course of treatment, the total clinical efficacy of the observation group was higher than that of the control group ( $P < 0.05$ ), but there was no follow-up after six months.

Liu Yonggang et al. [30] selected 263 patients in the total sample size, including 76 in the irrigation group, 72 in the irrigation group + hyaluronic acid injection group, and 115 in the conservative treatment group. The results showed that the overall analgesic use rate, NSAIDs use rate, and weak opioid use rate of patients in the irrigation group and the irrigation HA group were significantly lower than those in the conservative group ( $P < 0.05$ ). There was no significant difference in the use rate of strong opioids among the three groups ( $P > 0.05$ ). The proportion of patients in the irrigation group and the irrigation HA group who underwent new TKA surgery in the first to third years was lower than that in the conservative group, and the difference was statistically significant ( $P < 0.05$ ). There was no significant difference in the proportion of new TKA surgery and the overall TKA surgery rate among the three groups in the fourth and fifth years ( $P > 0.05$ ). Compared with before treatment, the K-L ratings of the three groups were significantly aggravated after 5 years of follow-up ( $P < 0.05$ ).

Liu Qian et al. [31] used Chinese medicine fumigation combined with flurbiprofen cataplasm application in 106 total samples, with 53 cases treated with flurbiprofen cataplasm application, and 53 cases treated with flurbiprofen cataplasm application. The results showed that the difference was statistically significant ( $P < 0.05$ ). After three months of follow-up, the scores of each dimension of SF-36 in both groups were improved compared with those before treatment, and the score in the observation group was higher than that in the control group ( $P < 0.05$ ).

Sun Xiaohui et al. [32] used 76 total samples, with 38 cases injected with compound betamethasone and sodium hyaluronate, and 38 cases injected with sodium hyaluronate alone. The results showed that the total score of GQOLI-74 in both groups of patients increased, and the score in the study group was higher than that in the control group, and the difference was statistically significant ( $P < 0.05$ ). No follow-up after six months was performed.

Pan Qihua et al. [33] conducted a study on 60 total samples, 30 of which were treated with modified Danggui Sini Decoction combined with warm acupuncture, and 30 of which were treated with oral celecoxib capsules. The results showed that the total effective rate of the study group was 93.33%, which was higher than 73.33% of the control group ( $P < 0.05$ ). No follow-up was conducted after 6 months.

Wei Lianggang et al. [34] conducted a study on 57 total samples, 29 of which were treated with oral Duhuo Jisheng on the basis of the control group, and 28 of which were treated with oral glucosamine hydrochloride capsules. The results showed that the total effective rate of the study group was 96.55%, and the total effective rate of the control group was 78.57%. The clinical efficacy of the study group was better than that of the control group. No follow-up was conducted after 6 months.

Jia Xiaojun et al. [35] conducted a study on 90 total samples. Thirty cases were treated with a specially arranged systematic education video on the basis of observation group 2. Thirty cases were treated with three TCM characteristic therapies on the basis of the control group. Thirty cases were treated with basic drug treatment + TCM syndrome differentiation and treatment oral Chinese medicine + physical therapy, plus traditional hospitalization education by daily medical staff. The results showed that the comprehensive intervention program combining traditional Chinese and Western medicine with conservative treatment was indeed effective in the treatment of senile KOA. TCM characteristic therapies significantly increased the efficacy, and the difference was statistically significant ( $P < 0.05$ ). No follow-up after six months was conducted.

Zhao et al. [36] conducted a study on 364 total samples, including 182 laser treatments and 182 sham laser treatments. The results showed that after 4 weeks of laser moxibustion treatment, there was a significant effect in relieving knee pain and improving function, and the differences were statistically significant (all  $P < 0.05$ ). The treatment effect can be extended to 20 weeks. No follow-up after six months was conducted.

Hou Zengtao et al. [37] conducted a total of 90 samples, 45 of which were injected with platelet-rich plasma into the joint cavity, and 45 of which were injected with sodium hyaluronate into the joint cavity. The results showed that the total effective rate of the observation group was higher than that of the control group. The difference was statistically significant. The VAS scores at 1 week, 1 month, 2 months, and 3 months after treatment were lower than those of the control group, while the Lysholm scores

were higher than those of the control group. The difference was statistically significant. No follow-up was performed after 6 months.

Ma Wei et al. [38] conducted a total of 90 samples, 45 of which were treated with Guizhi Shaoyao Zhimu Decoction combined with diclofenac sodium, and 45 with diclofenac sodium sustained-release tablets. The results showed that Guizhi Shaoyao Zhimu Decoction combined with diclofenac sodium was effective in treating patients with wind-cold-dampness-type degenerative knee osteoarthritis, and the difference was statistically significant ( $P<0.05$ ). No follow-up was performed after 6 months.

Deng Baofeng et al. [39] conducted a study on 114 patients, 57 of whom received traditional Chinese medicine massage and 57 of whom took oral nonsteroidal anti-inflammatory drugs (NSAIDs). The study observed the changes in HSS pain scores before and after treatment and evaluated the clinical efficacy. The results showed that the total effective rate of the observation group was better than that of the control group ( $P<0.05$ ). No follow-up was performed after 6 months.

Li et al. [40] conducted a study on 93 patients, 48 of whom received Qinglong wagging tail acupuncture and 45 received traditional electroacupuncture. The study collected VAS scores, Lesesne and WOMAC indices, and changes in inflammatory factors in the blood before and after treatment in the two groups and compared them. The study found that the total response rate of the observation group was better than that of the control group, which was statistically significant ( $P<0.05$ ). No follow-up was performed after 6 months.

## 5. Summary

There are many insights into the pathology of degenerative knee osteoarthritis. Although the treatment methods are different, they all focus on treating inflammation and pain in the knee joint. There is a lack of exploration and solutions to the root cause of the problem, resulting in only short-term effects during the study. The study by Liu et al. [28] showed no substantial help for degenerative knee osteoarthritis after two years of follow-up. In the study by Liu Yonggang et al. [30], there was no statistically significant difference in the proportion of new conversion to TKA surgery and the overall proportion of TKA surgery among the three groups of patients in the 4th and 5th years ( $P>0.05$ ). After 5 years of follow-up, the K-L ratings of the three groups of patients were significantly aggravated ( $P<0.05$ ). In the study by Liu Qian et al. [31], after three months of follow-up, the scores of each dimension of SF-36 in both groups were improved compared with those before treatment, and the score of the study group was higher than that of the control group ( $P<0.05$ ), which also shows short-term efficacy but cannot prove long-term efficacy.

Injection of any drug into the knee joint capsule is helpful for degenerative knee osteoarthritis. If used alone, no matter whether the injected liquid is transparent, steroid, or other plasma products, it can only have a half-year or short-term effect. Oral hormones, analgesics, Chinese medicine or Chinese medicine fumigation, pain-relieving patches, acupuncture, massage, laser moxibustion, sensory nerve block (GNB), etc., are

all effective anti-inflammatory and analgesic methods. Research literature confirms that if used alone, all methods have short-term effects. Once the analgesic and anti-inflammatory effects disappear, the development of degenerative knee osteoarthritis will follow, so there will be no long-term effect. Active exercise therapy is suitable for early degenerative knee osteoarthritis, loosening stiff muscles, and reducing knee joint pressure. The current treatment method is only for the symptomatic treatment of the knee joint rather than solving its root cause.

The amount of knee joint fluid in the knee joint capsule affects whether the femur and tibia are in contact and wear. The development of degenerative knee osteoarthritis depends on the degree of damage to the cartilage in the knee joint. Just as high intraocular pressure in glaucoma affects the optic nerve, joint pressure affects the synovial membrane's ability to secrete sufficient joint fluid, resulting in degenerative knee osteoarthritis. Restoring the normal amount of joint fluid in the knee joint capsule is one of the key elements in treating degenerative knee osteoarthritis. Excessive muscle tension is the main source of knee joint pressure, and poor leg bone position further promotes muscle tension. The leg muscles are intertwined on the knee joint, and coupled with accidental injuries, excessive exercise, weight, age, gender, and other factors, the leg muscles become more tense, further accelerating the development of degenerative knee osteoarthritis.

Regulating tense muscles, promoting normal pressure in the knee joint capsule, guiding the synovial membrane to secrete normal joint fluid, and separating the femur and tibia, the body's immune system can automatically repair the damaged cartilage, and degenerative knee osteoarthritis will heal naturally. Research literature shows that injection therapy in the knee joint capsule can immediately reduce inflammation and relieve pain, but it only maintains a short-term effect. If the obstacles can be eliminated and the normal secretion of joint fluid in the knee joint capsule can be restored, the problem of degenerative knee osteoarthritis will be naturally solved. Leg muscle tension is the main source of pressure in the knee joint, affecting the normal secretion of knee joint fluid. The leg muscles are linked to the hips and knee joints. Completely loosening the leg muscles requires treatment from the waist to below the knee joint. Research literature also shows that acupuncture and massage are effective methods for loosening muscles. From the proven effective treatment methods, knee joint injection combined with acupuncture and massage therapy can eliminate inflammation and pain in the knee joint, improve the pressure in the joint capsule, promote the knee joint to restore normal secretion of joint fluid, and repair the damaged knee joint. This is a feasible optimization solution.

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