

# *Treatment of Lower Limb Muscle Strength Decline after Knee Arthroplasty Based on "One Gas Circulation Theory"*

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**Abstract:** The imperial physician of the Qing Dynasty, Huangdi Neijing and Yinjing, published Four Holy Heart Sources, and put forward the theory of "Earth, Four Elephants, One Circulation of Qi", that is, "Water, Fire, Metal and Wood Four Elephant Ascending and Descending of Yin and Yang, all around the earth, such as no reason. Combined with the theory of "Treating Impotence by Taking Yangming Alone" in "Internal Classic", the author thinks that it has certain guiding significance for the clinical rehabilitation of muscle strength decline of patients after knee joint operation. All types of postoperative patients with muscle strength decline due to limited Qi and blood metaplasia, and therefore poor muscle nutrition. [1] Through retrieving the relevant literature in recent years, this paper discusses the feasibility of the recovery of muscle strength by focusing on the treatment of spleen, stomach and kidney.

## 1. Introduction

Traditional medicine believes that muscle strength and muscle atrophy after knee joint surgery belong to the category of "atrophy". The muscles and veins cannot move according to their wishes due to qi deficiency and blood stasis at the surgery site, and the veins are not prosperous. It is the house of tendons, ... knee pain is always due to liver and kidney deficiency, and deficiency will be attacked by wind, cold and dampness." [2] Therefore, qi deficiency and blood stasis are the pathogenesis of this disease, and the feeling of external pathogens and sprains are caused by atrophy. External conditions, the deficiency of the positive and the external, especially the deficiency of the liver and the kidney, is the internal basis for the occurrence of atrophy. Based on the study of its etiology and pathogenesis, modern TCM masters have different understandings of atrophy and syndrome differentiation, but it is not difficult to find that the common features of all types are joint pain, swelling and restricted movement. The clinical effect of using the theory of "one-qi circulation" in the treatment of postoperative muscle strength decline of the knee joint is remarkable, but there are few relevant research reports. This article searches the relevant literature to discuss the treatment according to the "one-qi circulation, soil pivot and four images" theory. Feasibility of lower extremity muscle strength loss after knee surgery.

## 2. Development of muscle strength

To better understand the clinical manifestations of the disease, it is necessary to review the concept of "muscle strength". Muscle cells are rich in myofilaments with systolic characteristics. It is the "engine" of various physiological activities of the body and plays an important role in providing power [3]. For example, the relaxation and contraction of the myocardium controls the ejection function and rhythm of the heart; the relaxation and contraction of the smooth muscle of the organs controls the normal operation of the respective organ functions, such as the smooth muscle of the gastrointestinal tract, the smooth muscle of the uterus, and the detrusor of the bladder; and the relaxation and contraction of the skeletal muscle. The contraction controls the movement of the human bones, such as the voluntary movement of the limbs, the breathing movement, and the movement of the spine. When muscles contract, they will generate a comprehensive vector force to achieve the target action, which is called "muscle force". The formation of muscle strength is a process of dynamic shaping. The human body system, especially the motor system, predicts the muscle strength required for skilled performance of the action by forming an internal model, so as to adapt to a new dynamic environment [4]. At the molecular level, muscle contraction is an extremely shocking and important process linking biological behavior and mechanics. From the molecular force between actin and myosin, the myosin superfamily converts chemical energy by hydrolyzing ATP. Converted into mechanical energy, then to a wider range of muscle cell behavior, and then expanded to the function of the entire muscle and limb [5], resulting in our every heartbeat, breathing and walking, arm swing, unique behavior at every physiological scale. Therefore, the study of muscle strength is very important and necessary.

## 3. The pathogenesis of decreased muscle strength

Decreased muscle strength is a syndrome characterized by a progressive decrease in skeletal muscle mass and strength. At the macroscopic level, when the muscles are actively moving, the activity strength and range of motion of the joints and limbs driven by them decrease to varying degrees. The microscopic level mainly includes the following aspects: First, about 20% of the muscle weight is protein. When various reasons lead to a decrease in protein synthesis or an increase in consumption, the normal muscle content cannot be maintained and the disease occurs; It plays an important role in regulating the balance of muscle mineral metabolism and improving skeletal muscle health. Second, studies have shown that [6] VitD plays an important role in regulating the balance of muscle mineral metabolism and improving skeletal muscle health through VDR. If VitD is deficient, it may lead to decreased muscle strength. Third, inflammation and cytokines, potential cellular changes include promoting muscle anabolism. Factors were attenuated, and the expression of inflammatory factors and other factors that promote skeletal muscle catabolism was increased. At the cellular level, these molecular processes manifest as loss of muscle fiber cross-sectional area, loss of innervation, and adaptive changes in the ratio of slow and fast motor units in muscle tissue [7]. This eventually leads to the decline of muscle cells, which in turn manifests as a gradual decline in muscle strength. For example, the decrease in muscle strength caused by rheumatoid factor (RF), studies have shown [8] about 66% of RA patients in the process of disease progression, skeletal muscle cell mass progressively decreased, muscle protein consumption continued to increase, resulting in a significant increase in muscle strength reduce.

## 4. Etiology

### 4.1. Traditional Medicine Etiology

As far as traditional medicine is concerned, decreased muscle strength after knee joint surgery belongs to the categories of "atrophy", "impotence" and "limb atrophy". The cause is nothing more than a disorder in the distribution of the lungs and fluids, inability to nourish the tendons, or insufficient biochemistry of the spleen and stomach, lack of qi and blood sources, or damage to the liver and kidney, withered marrow and tendon atrophy. In terms of the etiology and pathogenesis of atrophy, the classics of physicians in the past dynasties have described it in many classics: as the "Su Wen·Atrophy Theory" says: "Yangming is the sea of five viscera and six fu organs, which controls the tendons of the zongs, and the tendons of the zongs bind the bones and benefit the organs. Also" and thus put forward the general principles of acupuncture and moxibustion treatment for atrophy, "the person who treats atrophy only chooses Yangming" and "each supplements the ying and the shu, adjusts the deficiency and excess, and reverses it". Another example is "Jingyue Quanshu·Atrophy Syndrome", which says: "If the vitality is deficient, the essence cannot be irrigated, and the blood cannot be nourished." If there is less blood and qi, it cannot moisten and nourish the tendons, so they relax, and if the tendons are long, the belt and veins cannot be drawn, so it is not necessary for foot atrophy."Therefore, according to the theory of "one qi circulating around, soil pivot and four phenomena", combined with the exposition of the etiology and pathogenesis of atrophy in the classics of many physicians in the past dynasties, it can be seen that focusing on the qi of the spleen and stomach meridians of Yangming is the cause and pathogenesis of postoperative muscle strength decline. Treatment is the key.

### 4.2. Modern medical causes

There are usually two reasons for muscle strength decline after knee joint surgery, one of which is disuse muscle strength decline, total joint replacement, ligament repair, tibia or femur fracture, meniscectomy and other types of knee surgery Posterior articular fibrosis will induce changes in the viscoelasticity of the soft tissue around the joint, leading to joint flexion, joint stiffness and contracture symptoms, [9] causing pain in patients with knee joint movement and resisting movement, or long-term immobilization due to the disease, The long-term disuse of the lower limbs results in decreased muscle fiber activity, decreased muscle contraction ability and strength, and reduced cross-sectional area of muscle fibers, resulting in decreased muscle strength including maximum strength, speed strength, and endurance strength; the second is joint-derived muscle strength, Due to the inflammatory response around the injured joint, the body-related nerves and receptors have a protective inhibitory mechanism, which will aggravate the decline of muscle strength.

Conventional rehabilitation methods include CPM training, that is, a joint motion system that combines the principles of static progressive stretching (SPS) and stress relaxation (SR) and uses low-stress turnbuckle technology to achieve continuous stretch, which is static and progressive for patients. Sexual stretching therapy to achieve self-controlled treatment mode [10]. However, this program requires long-term and stable systematic training, and requires high doctor-patient cooperation. In terms of drugs, the main drugs for muscle strength loss after joint surgery are mainly nutritional nerve drugs such as vitamin b12, as well as preventive treatment drugs, such as anti-inflammatory treatment using hormone drugs such as prednisone, and prevention of thrombosis such as aspirin and clopidogrel.

## 5. "One qi circulates around, the earth pivots and the four images"

That means qi machine, which is the movement mechanism of human qi. It covers the functional activities of the zang-fu meridians in the form of ascending and descending. "Plain Questions. The Great Theory of Six Subtle Purposes": "It is based on ascending and descending and entering and exiting, and there are no objects. Therefore, the objects are the universe of biochemical transformation. When the objects are scattered, they are divided, and the biological and chemical breaths are completed., the period is near and far, and the existence of the four is precious and constant, and the abnormality will bring disaster." [11] The normal rise and fall of the qi machine ensures the normal progress of the body's spirit, qi and blood, and the functions of the viscera and meridians. If there is ailment, the human body cannot be healthy. The Qi of "One Qi circulating around" refers to "Qi" in a broad sense. It includes the Zong Qi that penetrates the heart channel and controls breathing; the Qi that inherits the innate and transforms the essence of life, Guarding the defense of the muscles. "Zhouliu" means that the above-mentioned "Qi" traverses the zang-fu organs, and the zang-fu organs perform their own functions, like a ring for no reason. As stated in "Plain Questions: Theory of Pain": "The meridians and collaterals are constantly popular, and the circulation is endless." Among them, the spleen and stomach are in the middle, and "The Four Sacred Heart Sources Book One Day to Solve the Changes of Yin and Yang" says: "When it rises, it becomes yang., the descending is yin, yin and yang are in different positions, and the two instruments are divided. Between the clear and turbid, it is called the middle qi, and the middle qi is the pivot of the rising and falling of yin and yang, the so-called earth." The lift of the driver is the pivot of Qi, [12] which is the "Four Elements of Earth Pivot".

## 6. Warming the kidney, strengthening the spleen and invigorating the stomach qi, one qi circulation to treat atrophy

Due to postoperative muscle strength decline, the disease site is often in the spleen and stomach, and the disease is mostly deficiency syndrome, and there are Foot Yangming Stomach Meridian and Foot Taiyin Spleen Meridian at the knee joint. However [13], inspired by this theory, the focus of the treatment of atrophy should be on the spleen, stomach and kidney, and the combination of prescriptions and acupuncture is often used in clinical practice. The commonly used prescriptions are Modified Decoction for Treating Impotence. The formula in the formula is attached to the tablet as the king, and its power is to warm the meridians, dredging collaterals and relieve pain. Chinese yam and white peony are both ministerial medicines, which can nourish qi and nourish yin, invigorate the spleen and kidney, and can also restrict the acrid heat and warm dryness of the main medicine; Poria, Atractylodes, and Guizhi are adjuvant medicines, which are used to invigorate qi, invigorate the spleen, and clear joints; Achyranthes, Tianma and Licorice are used as medicines, and the gong is used to induce medicine to go down, and to reconcile Qi, blood, yin and yang. All medicines are used in combination to nourish the spleen and stomach and kidney meridian essence. In terms of acupuncture, the main acupuncture points are selected according to the treatment principles of Ren meridian for treating spleen-stomach-qi deficiency type atrophy[14], and the main points of the stomach meridian of Foot Yangming, the spleen meridian of Foot Taiyin, and the main points of treatment: Guanyuan, Qihai, Yinlingquan, Sanyinjiao, and Diaphragm are used to replenish qi and blood throughout the body, especially in the spleen and stomach. The acupoints are often selected: Hedong and Futu are used to relax joints, activate collaterals and relieve pain; Liangqiu and Zusanli strengthen the spleen and stomach, and nourish qi. Blood; Relieves Streams, relaxes tendons, activates collaterals, regulates and nourishes Stomach Qi; The above-mentioned prescriptions and acupuncture treatment programs reflect the "Four Sacred Heart Sources, Heaven and Human Solutions, Qi and Blood Sources": "If the kidney water temperature rises and turns

wood, it is also related to the left rotation of the earth and the spleen, and the spleen is the root of blood; When the Qing Dynasty descends and transforms into gold, the right turn of the Wu soil is also based on the stomach as the source of qi transformation.” The treatment method embodied in warming the kidney, strengthening the spleen and invigorating the stomach qi makes the water warm and earth warm, one qi circulates around, and is born incessantly, the disease will heal day by day.

## 7. Case study example

The case study is a patient named Shan, male, 46 years old, who was first diagnosed on October 12, 2021. The patient entered the consultation room with crutches and complained: "numbness and weakness of the left lower limb for three months". The patient underwent repair of the ruptured lateral collateral ligament of the left knee joint three months ago, and the postoperative rehabilitation training was neglected. The following symptoms include: postoperative muscle atrophy of the left lower extremity, stiffness and pain of the knee joint, aggravated by cloudy and rainy days, poor mentality, thin body and fatigue, self-consciousness. Sometimes the body is cold and chills, the limbs are cold, especially in winter, the appetite is poor, the rest at night is acceptable, and the stools are normal. Pale tongue, weak pulse. Specialist physical examination: walking lameness, left quadriceps muscle atrophy, 10cm above left patella circumference: left 22cm, right: 25cm. Left quadriceps muscle strength: grade 3; knee joint stiffness, range of motion 90°; HSS score: 65; tenderness (+), the tenderness point is located in the lateral space of the left knee joint and the left knee eye, and there is a snapping sound during passive movement, the floating patella experiment (+). Auxiliary examination: Imaging examination: 1. EMG report sheet: the amplitude of the motor nerve conduction evoked potential in the left quadriceps muscle decreased 2. X-ray film showed: the left knee joint space was narrowed. 3. MRI showed: left quadriceps muscle fiber atrophy with local degeneration, adipocyte hyperplasia with a small amount of inflammatory cell infiltration; postoperative changes of the lateral collateral ligament of the knee joint; knee joint effusion; Western medicine diagnosis: left knee joint surgery Quadriceps atrophy. Chinese medicine diagnosis: atrophy, the syndrome is deficiency of spleen and kidney essence and qi. Governing Law: Wenshen, spleen and Qi. Traditional Chinese medicine recipes: Zhiwei Decoction and Buzhong Yiqi Decoction. Prescription: System attached tablet 6g, Codonopsis 10g, Astragalus 20g, Mulberry parasite 12g, Atractylodes 8g, Poria 8g, Bupleurum 6g, Achyranthes huai 12g, Corydalis fragrans 16g, Jujube 8g, Licorice 8g. Decoction method: 400ml water decoction, twice a day, morning and evening. Acupuncture and moxibustion prescription: Sanyinjiao, Leaky Valley, Blood Sea, Hedong, Zusanli, Yinlingquan, Bigu, Shenshu, Zhubin, Yingu. Acupuncture and moxibustion techniques: After puncturing at each conventional depth, lift and interpolate for 1 minute, twist and supplement for 1 minute, and then retain the needle for 20 minutes. Follow-up visit on October 19, 2021: The weakness in walking has improved slightly, and the knee pain is sometimes felt. The spirit is still good, the appetite has improved, the body is thin, and the body is cold and aversion to cold. The overall condition of the patient has improved compared with the initial diagnosis, with no new symptoms and other adverse reactions, and the original treatment plan is planned to be continued for 3 weeks. The third visit on November 9, 2021: The patient is free from crutches and can walk for dozens of meters on his own. He rarely has cold pain in his knees, his body and hands and feet are warm, his appetite is acceptable, he is thin, and he is in good spirits. The initial diagnosis was much improved. Review of knee joint ultrasound: a small amount of fluid in the joint cavity, the echo is normal. Based on the improvement of the condition, go to the prescription to make Fu Pian and Bupleurum; reduce the amount of Astragalus to prevent excessive warming of Yang Yang, add Dendrobium, Polygonatum, and continue to take the remaining

medicines for 2 months, and stop the medicine according to the change of the condition. According to the physique of the patient with yang deficiency in this case, he neglected rehabilitation training due to fear of joint pain after surgery, and the recent cold season has damaged the yang qi of the spleen and kidney. When the wood fire loses its growth policy, one yang falls, the kidney qi is depleted, and then the disease is caused by cold and yang deficiency." [15] Therefore, it can be seen that the patient's whole body is cold and aversion to cold, and the hands and feet are not warm; Poor diet, water and grain metaplasia have no source, on the other hand, spleen and stomach transport and transformation are neglected, and water and grain essence cannot nourish muscles [16], so patients can see muscle atrophy. Its pathogenesis is deficiency of spleen and kidney yang, and stomach qi is not prosperous. Therefore, Zhiwei Decoction and Buzhong Yiqi Decoction are used to warm the kidney and strengthen the spleen. In the formula, Fu Pian is formulated to invigorate the kidney and warm the yang, nourish the fire of the gate of life, and also invigorate the spleen and stomach, dispel cold and relieve pain, so it is the monarch medicine; Shenqi tonifies the qi and nourishes the blood, warms the kidney and invigorates the spleen, and is a ministerial medicine. Atractylodes, Poria, invigorating spleen, invigorating spleen, invigorating qi and dispelling dampness, mulberry parasitic, Corydalis syringae, activating qi and activating blood, dredging collaterals and relieving pain are all adjuvants. Tonic in the gas. The combination of various medicines restores the Qi of the Middle Earth, "when the spleen is strong, the muscles are plump and full" [17].

## 8. Discussion

In view of the decrease in lower limb muscle strength caused by poor postoperative rehabilitation training of knee joints, including knee joint replacement, tibial plateau fracture, meniscectomy, and knee ligament repair, Zheng Qi et al [18] believed that early measures such as continuous Rehabilitation training programs such as passive activity rehabilitation training programs and knee joint robot training are beneficial to rehabilitation after knee joint surgery. Therefore, in accordance with the theory of "one qi circulation, soil pivot and four images" put forward by Huang Yuanyu, an imperial physician in the Qing Dynasty, the author discusses and treats atrophy of the type of deficiency of both kidney and spleen, and deficiency of stomach qi. Treating with Zhiwei Decoction, Buzhong Yiqi Decoction, and acupuncture and moxibustion prescriptions on the three meridians of the spleen, stomach and kidney embodies the combination of traditional medicine's "holistic view" and "diagnosis and treatment", and is also a reference treatment plan. If it can be combined with CPM training plan, rehabilitation robot, and shock wave therapy during the early rehabilitation treatment of knee joint surgery, it can also well reflect the concept of integrated traditional Chinese and Western medicine to treat diseases. According to the relevant literature, there are few literature reports on the postoperative muscle strength decline of the knee joint according to the theory of "one-qi circulation". The author uses this theory to conduct related research, which is a good way to diagnose and treat muscle strength decline after knee joint surgery. A useful exploration.

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