

# Different Rehabilitation Treatment Methods Used at Meniscus Injury

Ruihaoran Wang\*

School of Rehabilitation Medicine, Zhong Shan College of Dalian Medical University, Dalian, Liaoning, China

\*Corresponding Author: wangruihaoran@dmuzs.edu.cn

**Abstract.** Meniscus injury (MI) refers to a series of clinical symptoms resulting from the structural damage of the meniscus in the knee joint, which is caused by factors such as external forces or degeneration. This study aimed to explore the clinical efficacy and rehabilitation significance of rehabilitation treatment methods, including exercise therapy, physical therapy, and balance training, for patients with MI. By comparing the interventions of multiple rehabilitation treatment methods on MI patients and conducting systematic research, conclusions were drawn. The research results demonstrated that the three rehabilitation treatment methods, namely exercise therapy, physical therapy, and balance training, exhibited significant effects on the rehabilitation of MI patients. These methods not only effectively alleviated patients' clinical symptoms and restored knee joint function but also enhanced muscle strength and tone, increased joint range of motion, and enabled patients to perform daily activities and various sports. After a certain period of treatment, patients were able to achieve functional recovery and reintegrate into society and family more effectively. Compared with other treatment modalities, rehabilitation treatment was characterized by simplicity of operation, high safety, and low economic burden, presenting distinct advantages. The findings of this study can provide valuable data references for hospitals and therapists, facilitating the optimization of treatment plans in future work. It also offers an important basis for the rehabilitation treatment of MI patients, playing a positive role in promoting the development of rehabilitation treatment for meniscus injury.

**Keywords:** Knee; Rehabilitation; Multiple rehabilitation treatment methods.

## 1. Introduction

Meniscus injury refers to the damage caused by the meniscus tissue in the knee joint due to factors such as external impact, twisting, or degenerative changes. The term "meniscus injury" was first described in the late 18th century, and from its initial description, it has been classified into medial and lateral meniscus cartilage. The meniscus is a pair of C-shaped cartilage pads located between the femur and the calf, divided into the medial meniscus and the lateral meniscus. Their primary functions include stabilizing the knee joint, distributing knee joint loads, promoting joint nutrition, and providing cushioning during activities such as walking, running or jumping. Clinical symptoms mainly include knee pain, swelling, joint popping, joint locking, and in severe cases, limited knee joint mobility. To more effectively address and treat this condition, in addition to traditional conservative treatment and surgical intervention, rehabilitation training is particularly important. Initially, only conservative treatment and surgery were available, and later methods using rehabilitation techniques for meniscus injury rehabilitation emerged [1]. These rehabilitation training methods can not only relieve symptoms such as pain and swelling caused by meniscus injury but also protect the knee joint by enhancing the strength and stability of surrounding muscles, thereby long-term reducing the risk of further meniscus wear and tear.

Aquatic sports rehabilitation technology can be used for rehabilitation after sports injuries, and this method has been unanimously recognized internationally and applied in practice. However, in China, due to the late cognition of rehabilitation, this method has not been widely adopted by hospitals or rehabilitation institutions [2]. Theoretically, meniscus repair is feasible, but due to research limitations at home and abroad in this regard, physical therapy may be more effective [3].

In terms of overall incidence, according to relevant Chinese survey studies, the prevalence of meniscus injury in the population is approximately 4%-6%. Data also show that the incidence of meniscus injury is approximately 6-7 cases per 10,000 people per year. The incidence varies by age: the prevalence in the general population is about 0.5%, while that in the elderly population is relatively high, possibly as high as 50%. In sports injuries, meniscus injury accounts for about 5%.

This paper aims to elaborate on the research progress in the injury mechanism of knee meniscus in recent years, with a focus on its incidence in sports and its impact on athletes' health and careers, so as to help protect athletes' body structures, reduce injuries, and extend their sports careers. Generally, the most common injury sites are the meniscus, medial and lateral collateral ligaments, and anterior cruciate ligament, with meniscus injury being the most severe [4]. In addition, the rehabilitation process is inseparable from the early formulation of rehabilitation plans, which helps with the planning and arrangement of patients' recovery[5]. Due to the slow recovery of meniscus injury, combined treatment with different techniques can be considered, which is the main focus of this paper. By comparing the characteristics of different treatment methods and their most suitable populations, this paper provides good guidance for patients to choose treatment methods according to their own conditions.

## **2. Meniscus Function and Injury Mechanism**

The menisci are composed of two fibrous cartilage plates: the lateral epicondyle of the patella and the medial tibia. The medial meniscus is C-shaped, and the lateral meniscus is O-shaped. These two cartilage plates are important components of the menisci, both of which are thicker on the outside and thinner on the inside. This structure is conducive to protecting the knee joint, creating conditions for the knee joint to perform various movements in all directions, and also helps with knee joint stability [4]. The menisci have multiple functions, such as shock absorption, providing stability to the knee joint, and lubrication. The structure of the medial meniscus is more complex than that of the lateral meniscus, and due to its more complex structure, its injury risk is higher [6]. Some young people who love sports may suffer meniscus injuries due to external forces or sprains during intense competitive events. Alternatively, when the knee joint is in a flexed state, if the lower leg remains stationary and the thigh suddenly rotates internally or externally, the meniscus is easily squeezed, causing torsional injury. Some people engage in long-term physical labor, frequently going up and down stairs or carrying heavy loads, leading to long-term knee joint loading and thus causing injuries. The severity of meniscus injury is classified according to its location and type. Clinically, horizontal tears, complex tears, vertical tears, and root tears are described to determine the severity of the injury. Among them, horizontal tears and complex tears are the most common, and vertical tears are more common in acute injuries [6]. Vertical tears are the most common type of acute injury, often severe, with a long recovery time, and many young people are injured in sports due to this. However, not all meniscus injuries require surgical treatment, and different rehabilitation methods can be adopted according to the severity of the injury. For patients with incomplete tears, single or multiple combined rehabilitation methods can be used, and different rehabilitation techniques can be applied to promote recovery.

## **3. Rehabilitation Treatment Methods**

First, sports rehabilitation is a way to improve quality of life and help restore physical function after injury or illness through scientific exercise training and rehabilitation techniques. It can be seen that most meniscus injury patients suffer from excessive wear on the forefoot or excessive wear on the medial and lateral menisci. When an external force suddenly extends a semi-flexed knee joint, or although the external force is not sudden, the joint angle frequently changes repeatedly in daily life, combined with factors such as joint effusion, swelling, pain, and inflammation caused by the injury, all will ultimately limit joint movement and affect sports. Not using exercise therapy may affect the patient's daily life and motor ability.

Second, continuous passive motion (CPM) training is an efficient rehabilitation treatment method, with a faster recovery speed than traditional rehabilitation exercises. A hospital selected 78 patients from treatment cases between January and November 2019, divided into a control group (n=39) and an observation group (n=39) ( $P>0.05$ ) [7]. In terms of excellent and good rates, the observation group was significantly better than the control group: 36 out of 39 patients in the observation group achieved excellent or good results, compared with only 28 in the control group [7]. This method uses a knee continuous passive motion instrument (CPM) to drain knee joint effusion, enhance muscle strength, increase joint range of motion, and relieve pain [8].

Third, when it comes to physical therapy, doctors may think of various physical factors commonly used in daily life, such as water, electricity, heat, and pulses. Physical therapy has the effects of anti-inflammation and pain relief, promoting blood circulation, and restoring joint function. Heat therapy can relax muscles and reduce muscle spasm, thereby relieving pain. Ultrasound has strong penetrability, which can promote blood circulation and lymphatic circulation, improve local tissue status, and enhance blood vessel flow. Intermediate frequency pulse electrotherapy instrument is also a common method for meniscus injury. According to the severity of the disease, different degrees of meniscus injury can be treated. This method is easy to operate and can effectively promote the recovery of motor function [9]. Hydrotherapy can help patients restore the weight-bearing capacity of their knee joints. The principle is based on the buoyancy of water, and the greater the buoyancy, the less damage it will cause to the joint. Therefore, patients can train their running, jumping, and walking functions in water to achieve therapeutic effects.

Fourth is drug therapy, which mainly achieves the purpose of recovery by changing the physical and chemical conditions of the human body, promoting the recovery of one's own body's injuries, and reducing pain. Drug therapy can be administered to patients in various ways, with the main methods of administration being oral and intravenous. Oral drugs require patients to pay attention to the dosage and time, and should not be taken too early or too late. Pay attention to your feelings after taking it and communicate with your doctor in time. If there is discomfort or any discomfort after taking medication, it is necessary to communicate with a doctor in a timely manner for treatment and adjust medication intake. The injection method is to inject the drug directly into the area around the meniscus to reduce pain and inflammation. Patients must be treated strictly according to the doctor's prescription, and the number and frequency cannot be decided by themselves [9]. After injection, patients should strictly follow the doctor's instructions and cooperate with the doctor for relevant operations and subsequent rehabilitation treatment. They should not eat foods that may cause drug resistance or discomfort to avoid prolonging the rehabilitation period or poor treatment effect. Regular follow-up visits to the hospital are necessary in the later stage to demonstrate the recovery effect to doctors in a timely manner. However, researchers have found that for non-traumatic meniscus injuries, the healing effect of drug therapy is the same as that of other rehabilitation therapies. Further research has found that the combined use of drugs and hydrogel can effectively reduce inflammation in the knee joint cavity and improve knee joint function, while the effect of using drugs alone is not significant [10].

Fifth, some traditional Chinese medicine rehabilitation therapies, such as acupuncture and moxibustion, massage, and massage, are also worth considering. This method is mainly in the area near the knee joint, up and down massage to generate heat for the knee joint, and through acupuncture and moxibustion, the pain of the knee joint is relieved [4]. Many elderly people in China prefer traditional Chinese medicine rehabilitation methods to restore knee joint injuries, which is the largest audience for this method. Rehabilitation of traditional Chinese medicine has a history of thousands of years, especially acupuncture and moxibustion therapy. In clinical practice, acupuncture and moxibustion technology has a good clinical effect on knee arthritis, among which, acupuncture and moxibustion therapy includes warm acupuncture and moxibustion, electroacupuncture and acupuncture and moxibustion [11].

#### **4. Suggestion**

In summary, each rehabilitation treatment method for meniscus injury has its own advantages and disadvantages. For acute exercise or external injuries, exercise therapy is recommended. This method is highly targeted to those injured by exercise therapy, and each helps to recover exercise therapy. The preferred method of many athletes is also exercise therapy, which can help them recover from injury to their original state and still perform well in their comeback. CPM technology is mainly used to increase the mobility of the knee joint, increase muscle strength, and strengthen the flexibility of the knee joint. This method will have a significant improvement for patients who persist in training. Compared with some traditional therapies, this method is fast and highly recognized, and has won wide praise. There is a wide variety of physical factor treatment methods. Generally, hospital pools, ultrasonic instruments, hot compresses, ice bags, etc. are used to help patients recover. This method has a good therapeutic effect and can be used with other methods to provide patients with one more choice. There are some precautions for drug therapy, which must be used with hydrogel to highlight the effect. Therefore, drug therapy has some disadvantages, that is, to choose a suitable combination. If the combination is improper, it will cause adverse reactions to the patient. Drug therapy needs to pay attention to the patient's contraindications and whether there is a history of allergies. Drug therapy needs to pay attention to the patient's contraindications and whether there is a history of allergies.

#### **5. Preventive Measures for Knee Joint Meniscus Injury**

For ordinary people, meniscus injury is a common disease, and taking the right measures can prevent meniscus injury. Effective and correct measures mainly include sufficient preparation for activities before training, avoiding excessive and vigorous exercise when there is meniscus injury or potential risk, and evaluating whether exercise is possible based on one's own physical condition. If it is a special identity that requires a lot of exercise, such as an athlete, it is necessary to fully warm up in advance according to the guidance of a professional coach, and wear necessary protective equipment or muscle patches to improve personal joint protection awareness. Elderly people should not engage in vigorous exercise. Moderate activity is beneficial for physical health, but the duration should not be too long. At the same time, do not stand for long periods of time or compress the knee joints.

#### **6. Conclusion**

This article elaborates on the mechanism, influencing factors and preventive measures of knee meniscus injury. The knee joint is a part that bears great pressure in sports, and the study of its protection and rehabilitation methods is particularly important. For patients injured by MI, after specialized rehabilitation treatment, the patient's functional activity is further improved. Some patients' knee joint mobility can reach a normal level, and muscle strength can also be basically restored. In summary, the use of different types of rehabilitation treatment methods to treat meniscus injury is still in its infancy. There is no strong evidence to show which method is the most effective way to treat MI. The effect of various rehabilitation methods on patients with MI still needs long-term follow-up. For MI patients, if the effect of a single treatment cannot reach the most ideal situation, a variety of physical therapy methods should be adopted, which can improve the degree of recovery, shorten the recovery time of patients, and achieve a higher level for patients to return to their families and society. Patients should pay attention to their diet, gradually exercise, control the intensity and duration of training, stretch before and after exercise, and develop a reasonable exercise plan and schedule for patients. Rehabilitation therapists are ideal guides for patients' recovery. In future clinical practice, therapists need to flexibly arrange treatment methods according to different patients' conditions, avoid overly single treatment plans, encourage patients more, help them build confidence and adhere to treatment, and continuously explore reasonable new measures suitable for different meniscus injury patients.

## References

- [1] Gee, S. M., Tennent, D. J., Cameron, K. L., & Posner, M. A. (2020). The burden of meniscus injury in young and physically active populations. *Clinics in sports medicine*, 39(1), 13-27.
- [2] Zhao Rongting, Sheng Lei. The effect of underwater exercise rehabilitation on the functional recovery of patients with knee joint injuries[J].*Sports and Science*,2023,44(02):110-120.DOI:10.13598/j.issn1004-4590.2023.02.013.
- [3] Bansal S, Floyd ER, A Kowalski M, et al. Meniscal repair: The current state and recent advances in augmentation. *J Orthop Res*. 2021;39(7):1368-1382. doi:10.1002/jor.25021.
- [4] Huang Xiaolong, Wu Weijun. Overview of the mechanism, treatment, rehabilitation and prevention of knee joint meniscus injury[J]. *Sports Science and Technology Literature Bulletin*, 2021,29(09):200-202. DOI:10.19379/j.cnki.issn.1005-0256.2021.09.065.
- [5] Bansal S, Floyd ER, A Kowalski M, et al. Meniscal repair: The current state and recent advances in augmentation. *J Orthop Res*. 2021;39(7):1368-1382. doi:10.1002/jor.25021
- [6] Jeon G H ,Lee H J ,Kang K T , et al.Rehabilitation and Return to Play of an Ice Hockey Athlete after Lateral Meniscus Repair: A Case Report[J].*Applied Sciences*,2024,14(10):
- [7] Tan Chunting, Liang Caizhu. The effect of continuous passive exercise on the postoperative rehabilitation effect of knee joint injury[J].*Chinese Medical Science*,2021,11(15):123-126.
- [8] Dechrit M ,Petrus S .Controlling a knee CPM machine using PID and iterative learning control algorithm[J].*TELKOMNIKA (Telecommunication Computing Electronics and Control)*,2020,18(2):1047-1047.
- [9] Sun Meng, Meng Nijia, Yang Guangliang, etc. Research progress on the injury mechanism of the knee joint meniscus in sports and its rehabilitation[J].*Health and beauty*,2024,(07):124-126.
- [10] Pan J ,Lei L ,Xichi C , et al.Applications and prospects of different functional hydrogels in meniscus repair[J].*Frontiers in Bioengineering and Biotechnology*,2022,101082499-1082499.
- [11] Zhang Kaiyue, Wang Yingying, Chen Shuai, etc. Current situation of clinical research on acupuncture and moxibustion therapy for knee osteoarthritis [J]. *Hebei Traditional Chinese Medicine*, 2022,44(11):1916-1920.