ISSN 2616-5791 Vol.5, Issue 12: 34-38, DOI: 10.25236/AJMHS.2024.051206

Analysis of Methods for Recovery of Femoral Posterior Muscle Group Injury in Sprinters

Xiao Teng[1], Shanqiang Li[1], Jing Pan[2]

[1]The affiliated Shenzhen School of Guangdong Experimental High School, Shenzhen, China, 518129
[2]Shenzhen Nanshan Foreign Language School (Group) OCT Primary School, Shenzhen, China, 518053

Abstract: *This paper briefly analyzes the cause of the sprinter femoral muscle loss, emphasizes the methods for sprinter after femoral muscle injury recovery, and put forward effective measures as a breakthrough point, to make reasonable training plan, strengthen the femoral muscle strength training, make full preparations for the activities and improve muscle coordination and relaxation ability, aims to provide reference for relevant personnel.*

Keywords: *sprinter, retroilus, injury recovery*

1. Introduction

When the retrofemoral muscle group injury occurs, athletes usually face severe problems such as significant decline in athletic ability and increasing pain, which not only seriously interfere with their daily training and competition performance, but also may have a profound negative impact on the athlete's entire career.Therefore, how to scientifically and effectively restore the injury of the retrofemoral muscles group has become a key problem for sprinters and coaches.

In terms of literature review, Kong Chao (2016) discussed the causes and rehabilitation exercises of posterior thigh muscle group injury in sprinters[1].Yu Xun (2021) studied the causes of femoral posterior muscle group injury in sprinters in the past decade[2].Cheng Zhen and Pan Shanglian (2023) have explored the recovery method of the femoral posterior muscle group injury in sprinters[3].Gu Yuzhi (2024) focused on the impact of knee extension strength training on muscle strength recovery in sprinters with hip injuries[4].However, although these studies provide some recovery strategies, there are still many unanswered questions in the specific mechanisms of retrofemoral muscle group injury recovery, the development of personalized rehabilitation programs, and the impact of psychological adjustment on the recovery process.In view of this, this study aims to further explore the recovery methods of the femoral posterior muscle group injury in sprinters, in order to provide more comprehensive and scientific guidance for athletes and coaches.

2. Causes of the Femoral Posterior Muscle Group Injury in Sprinters

2.1 Poor psychological state and physical state

In the process of physical training, if the athletes fail to achieve the established training goals or the completion is not ideal, they will often show a state of fatigue and distraction, which may lead to injury. On the eve of key competitions, athletes often experience high mental concentration and neuroticism. In the process of exercise, too much attention is paid to the improvement of performance, but ignoring the basic framework and technical essentials of exercise, these defects will induce injury accidents. Long-term high-intensity training and frequent competition will cause physical fatigue, which will then lead to reduced physiological activity, reduced reaction agility and attention, lack of energy, reduced muscle elasticity and tension, and decreased movement coordination. Local muscle fatigue is reflected in muscle tension, which cannot be completely relaxed in some movements. For athletes involved in sprints, injuries to the retrofemoral muscle group often result from poor physical condition during training or competition, such as illness or unhealed injuries, which results in decreased fitness and lack of strength and flexibility. External conditions such as seasonal changes and the condition of the site facilities may have a negative impact on the results.

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2.2 Lack of Preparatory Activities or Inadequate Preparatory Activities

After a detailed investigation and analysis, the lack of warm-up exercise has become the most prominent problem among various reasons. In the process of sports training and competition, many players often ignore the importance of the warm-up link and treat the warm-up exercise hastily. This attitude contains risks. If they fail to fully mobilize their muscles to the active state, they will exert their strength rapidly, resulting in stiff and uncoordinated muscles. During the research work, it was observed that the individuals participating in sports competitions did not have a comprehensive understanding of the preparatory activities. The purpose of warm-up is to reduce the idle state of organs, increase the sensitivity of the nervous system, improve the flexibility of soft tissues and joints, so as to optimize motor performance. For sprints, exclusive preparation activities are crucial to improving their anaerobic metabolic capacity. Under high intensity load, most muscles of the human body must undertake heavy work. If the warm-up is not sufficient, the body will be difficult to maintain the necessary coordination, the muscles will maintain a high viscosity, resulting in a lack of strength and flexibility, at this time, the local muscles may be damaged due to being unable to withstand a large load.

2.3 Strength Imbalance in the Anterior and Posterior Thigh Muscles

The biceps femoris, semitendinosus and hemimembranes together constitute the muscle groups of the posterior thigh. Because of the cross-sectional area of different muscles in the lower limbs, these muscles are relatively weak compared to the anterior muscle groups. The results reveal that the muscle strength in the anterior thigh is significantly 60 percent higher than that in the posterior thigh, and that the explosive force plays a decisive role in sprinting. When lifting their thighs, athletes must quickly and forcefully pedal on the ground with their feet. In order to run faster, the leg must have the corresponding strength to support. In physics, where the mass remains constant, there is a scaling relationship between force and acceleration, as described by formula _ F=ma. In order to enhance the strength of the lower limbs, athletes often use barbell squat and half squat jump and other training methods, these methods can effectively promote the improvement of quadriceps strength. In the process of exercise, if the strength of the quadriceps muscle is excessively strengthened and the training of the retrofemoral muscle group is ignored, the imbalance of the anterior and posterior muscle strength of the lower limbs will be further aggravated.

2.4 Muscles Work too Hard

The posterior femoral muscle group is a muscle group that is easy to be injured by the support reaction force during the sprint process. When the retrofemoral muscle group exerts the maximum effect, the resulting tension force also reaches the highest point. To overcome the inertia effect and avoid excessive extension of the knee joint, the retrofemoral muscles must tighten rapidly. However, excessively increasing the initial tensile strength of the posterior thigh muscles may lead to slow response and difficult to adapt to the requirement of super high load; meanwhile, intense total stretching will eventually induce physiological damage.

3. Methods for Recovery of Posterior Femoral Muscle Group Injury in Sprinters

3.1 Preliminary Treatment

Initial processing after femoral posterior muscle group injury in sprinters is vital. By collecting relevant literature data, once injury occurs, we should immediately stop exercise, choose bed rest, avoid thigh extension, sedentary and long squatting, so as to prevent further muscle contraction and traction aggravated injury[5]. After the investigation, Zhu Xiaoming found that within 24 hours after the injury, the injured area should be wrapped in ice[6].Each time is recommended to be 15 to 20 minutes to contract blood vessels, reduce local vascular rupture and bleeding, thus reducing congestion, swelling and inflammatory edema. At the same time, the injured site can be pressurized bandaged, using appropriate thickness and hardness of cotton pads, and raise the limbs to rest, which helps to reduce hematoma formation and accelerate tissue regeneration. If the pain is obvious, oral anti-inflammatory and analgesic drugs, such as ibuprofen sustained-release capsules, but they should be used under the guidance of a doctor to avoid abuse. The key to preliminary treatment lies in timely, scientific and comprehensive response to the injury, and laying a solid foundation for subsequent treatment and

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rehabilitation.

3.2 Interim Therapy

Mid-term treatment of posterior femoral muscle group injury in sprinters is a comprehensive rehabilitation process. Yan Huiyun[7] found that through the investigation, after 24 hours after injury, can change hot compress, use warm water bag or hot towel, the temperature is controlled at 40 to 50 degrees Celsius, each hot compress about 20 minutes, to promote local blood circulation, accelerate the metabolism and absorption of congestion and inflammation. At the same time, drug treatment, such as oral ibuprofen sustained-release capsules and other anti-inflammatory painkillers, can be administered, and the daily dose should follow the doctor's advice, usually not more than the maximum recommended daily dose, to reduce inflammation and pain. In addition, moderate muscle relaxation training should be performed, such as gentle massage and stretching, each lasting for about 10 minutes, 2 to 3 times a day, to relieve muscle tension and stiffness, and avoid intramuscular adhesion.

3.3 Rehabilitation Training

Rehabilitation training in sprinters is a gradual process[8]. After initial treatment and interim treatment, athletes can start some functional exercises, such as small leg pressing exercises, calf folding exercises and lunge walking, with 10 to 15 movements and 2 to 3 groups daily, to promote the gradual recovery of muscle function. Strength and scope of training and can be gradually increased as rehabilitation progresses. For example, resistance training with a rubber band or a fitness ball controls each session for 20 to 30 minutes, three to four times a week. At the same time, attention should be paid to control the amplitude and frequency of training to avoid secondary muscle damage caused by overtraining.

3.4 Professional Guidance and Supervision

Professional guidance and supervision in the recovery of femoral muscle injury in sprinters is the key to ensure the recovery [9]. Professional rehabilitation therapists or sports trainers will develop personalized rehabilitation training plans according to the degree of injury, physical condition and sports needs of the athletes.

By collecting relevant information, Chen Zhongguan found in the survey that during the training process, the trainer would guide the athletes to make correct movements and postures, such as using the hip bridge to strengthen the strength of the biceps, training 3 to 4 groups each time, 12 to 15 times, and rest between groups for 30 seconds to 1 minute[10] . At the same time, the trainer will monitor muscle activity through professional equipment and methods, such as EMG (EMG), to ensure that the training is scientific and effective. During the whole rehabilitation process, the professional guidance and supervision of the participation can significantly improve the rehabilitation effect, shorten the recovery time, and help the athletes to return to the competition as soon as possible.

3.5 Psychological Adjustment and Positive Attitude

Psychological adjustment is as vital as maintaining a positive attitude in sprinters [11]. Studies have shown that a positive attitude can significantly improve the efficiency and quality of the rehabilitation process. Athletes can communicate with professional psychological counselors to learn relaxation skills, such as deep breathing and meditation. Each practice lasts for 5 to 10 minutes, for two to three times a day, to help relieve the stress and anxiety caused by injury. At the same time, setting clear and achievable rehabilitation goals, such as increasing a certain weekly training intensity or completing specific functional exercises, can motivate athletes to keep moving forward. In addition, athletes can also share their rehabilitation progress with their teammates, coaches and rehabilitation therapists, get support and encouragement, and form a positive rehabilitation atmosphere. In the process of psychological adjustment, athletes can also track their progress and changes by recording their rehabilitation and diaries, and enhance self-confidence and sense of achievement.

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4. Effective Measures for the Prevention of Femoral Posterior Muscle Group Injury in Sprinters

4.1 Make a Reasonable Training Plan

Improving muscle coordination and relaxation is an important part of preventing retrofemoral muscle group injury in sprinters, which requires athletes to integrate targeted training content into the training program. In the formulation of training plans, the individual differences of athletes should be fully considered, combined with the physical condition, skill level and muscle characteristics, reasonable arrangement of training intensity and frequency, to ensure that athletes can fully exercise in the training process, without increasing the risk of injury due to excessive fatigue.

In the training program, some exercises aimed at improving muscle coordination can be added, such as one-leg balance, cross step, lateral movement, etc. These exercises can exercise the athletes' sense of balance and coordination, so that they can control the body more stably when running fast, and reduce the muscle strain caused by movement incoordination. At the same time, in order to enhance the relaxation ability of muscles, relaxation exercises, such as deep breathing, static stretching, etc., can be added to the training. These exercises help athletes relax the tense muscles during or after the training interval, promote blood circulation, and accelerate muscle recovery.

4.2 Strengthen the Strength Training of the Posterior Femoral Posterior Muscle Group

In the training process, special attention should be paid to the exercise of the femoral back muscle group, through a series of targeted strength training movements, such as squat, leg lifting, leg bending lifting and leg back swing, to enhance the strength and endurance of this key muscle group.

Squat is a classic composite action, which can not only exercise the femoral muscle group, but also activate the quadriceps and gluteus maximus, and promote the improvement of muscle coordination of the whole body. The leg lift focuses more on the isolated training of the retrofemoral group, by adjusting the training weight and the number of groups, which can effectively enhance the strength of the retrofemoral group. Leg bending is a training movement specifically for the biceps femoris, which helps sprinters better control their knee bending and stretching and improve their performance.

4.3 Make Full Preparations for the Activities

Before training or competition, athletes should invest enough time and energy to warm up, which is not only to activate muscles and raise body temperature, but also to enhance the coordination and relaxation ability between muscles.

The warm-up activities should be comprehensive and meticulous, covering all parts of the body, especially the lower limb muscle group, including the posterior femoral posterior muscle group. Aerobic exercises, such as jogging, high leg lifts, and side sliding steps, can quickly increase the temperature of the muscle, increase its elasticity and flexibility, and prepare it for the following high-intensity training or competition. At the same time, combined with some dynamic stretching actions for the femoral posterior muscle group, such as the leg posterior swing, kicking, etc., it can further activate these muscles, reduce the resistance in exercise, and improve the efficiency of exercise.

In addition, the warm-up process should also pay attention to the coordination of breathing, through deep breathing practice, can relax the tense muscles, improve the oxygen content of the body, to provide sufficient energy for the muscles. At the same time, deep breathing can also help to regulate the mental state, reduce the tension of the athletes, and make them more focused on the next training or competition.

4.4 Improve the Ability of Muscles to Coordinate and Relax

Improving the ability of muscle coordination and relaxation is an important guarantee for sprinters to achieve excellent results in training and competition. The improvement of this ability is not only about the strength and endurance of muscles, but also about how to achieve a dynamic balance between tension and relaxation, so as to optimize sports performance and reduce sports damage. These exercises are designed to enhance the synergy between the muscles through specific movement patterns, such as balance exercises, coordination exercises, and relaxation exercises. Balance exercises, such as standing on one leg and walking with their eyes closed, can exercise the athletes' core stability and muscle coordination, allowing them to control their body more stably while running fast. Coordination training,

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such as cross-step and lateral movement, helps to improve the movement flexibility and response speed of athletes in different directions.

At the same time, relaxation exercises are also an integral part of improving the muscle coordination and relaxation ability. Through exercises such as deep breathing, static stretching, and muscle relaxation techniques, athletes can effectively relax the tense muscles during or after the training interval, promote blood circulation, and accelerate muscle recovery. These exercises not only help relieve muscle fatigue, but also improve muscle flexibility and elasticity to prepare them for subsequent training or competition.

5. Conclusion

In conclusion, the recovery method of femoral muscle group injury in sprinters needs to consider multiple factors and focus on personalization, scientificity and comprehensiveness. At the same time, attention should also be paid to prevention to reduce the risk of injury of athletes from the source. It is hoped that the research in this paper can provide some useful reference for the recovery of femoral muscle group injury, and help them to return to the field more quickly and realize their sports dreams.

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