

# *Conservative Therapy and Rehabilitation Training of Rectus Femoris in Basketball Training*

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**Abstract:** Most muscle injuries are caused by stretching. A common cause is internal pressure caused by sudden, intense muscle contractions that cause muscles or tendons to tear. This article aims to study conservative treatment of rectus femoris laceration and rehabilitation training in basketball training. In the experiment in this paper, the recording electrode placed on the surface of the skin by dynamic electromyography is used to record the current during muscle contraction. The experiment uses a series of technical processes to obtain the myoelectric signal, and uses different analysis methods for data analysis to obtain the relevant muscle function status, Is a non-invasive inspection method. Surface electromyography (SEMG) is used to measure the electrical activity of basketball players during rectus femoris contraction, and amplitude and waveform characteristics are used to characterize the reflection of nerve impulse and activation characteristics of the muscular system. Experimental data shows that recording electrodes placed on the surface of the skin using surface electromyography to record the current during muscle contraction, through a series of technical processes to obtain EMG signals and data analysis, demonstrates the use of various analysis methods to obtain muscle function status. Experimental results show that the tear of rectus femoris affects 20-30% of basketball players, and the muscle strength of rectus femoris is 25% lower than that of normal basketball players. In addition to using surface electromyography to detect the basketball player's rectus femoris muscle activity, ultrasound can also be used to diagnose, through these two technologies to diagnose the athlete's rectus femoris tear situation can make better treatment and training programs for athletes.

## 1. Introduction

The quadriceps is the main muscle of the knee joint of the human body. It strengthens the muscle

strength of the quadriceps and improves the stability of the knee joint. The knee joint is one of the most complex joints in the human body. Because the medial and lateral condyles are not parallel, the size is different; the difference in the bending of the tibia; the difference in movement of the medial and lateral collateral ligaments. It is easy to cause twisting of ligaments and joint capsules during exercise; the pressure of the patella rises; the pressure on the joint contact surface increases. Therefore, it is easy to get injured, especially in sports activities.

Fatigue is a self-protection mechanism of the nervous system, that is, the central nervous system is less excitable and the frequency of nerve impulses is reduced. The electrical activity of the nervous system becomes orderly and simple, although the MPF and C (n) observations of the SEMG signal of the rectus femoris during the isometric contraction to fatigue can well reflect the above changes. Changes are more sensitive [1]. However, the physiological mechanism is not yet clear. Which sEMG signal characteristic indicators can more effectively reflect the SEMG signal activity law of related muscles and the degree of fatigue change of related muscles when the rectus femoris tears will be further applied to the research results of SEMG signals. The key to exercise practice is that the SEMG signal of the muscle will change accordingly when the muscle tears [2].

The research by Buckley et al. Showed that the quadriceps showed equidistant contraction at different angles of hip and knee at 80 ° hip flexion and 60 ° knee flexion [3]. In addition, some studies have shown that the knee joint is bent by 90 ° and generates the maximum torque during the maximum isometric contraction of the quadriceps. The isometric contraction training of knee extension can enhance the strength display of the quadriceps. Barnes et al.'S study showed that EMG amplitude and load are positively linear when applied, which is considered to be the result of selective recruitment of muscle fibers [4]. Active muscle electrode plates can collect antagonistic muscles, and the average amplitude of sEMG can better explain the overall innervation of specific muscles in a specific exercise. The application mechanism of SEMG is that the greater the strength of muscle contraction, the greater the amplitude of EMG.

In this paper, the surface electromyography (SEMG) was used to measure the electrical activity of the basketball player's rectus femoris muscle during contraction. The experimental results showed that the basketball player's rectus femoris muscle thickness, rectus femoris cross-sectional area, and quadriceps muscle strength were all  $P > 0.05$ . obey normal distribution. Through experimental research, it can be seen that surface EMG can be used as an indicator to assess the change of muscle strength before and after. At the same time, it also has important reference value for the method of muscle training, the type of muscle contraction, strength, and the selection of training posture.

## **2. Injury of Rectus Femoris and Its Detection**

### **2.1. Measurement Method of Rectus Femoris**

Surface electromyography cannot be used to measure muscle strength, but it can be used to measure the electrical activity of muscles during exercise. Different amplitudes lead to the recruitment of different numbers of motor units. In addition, some studies have shown that surface EMG can be used as an indicator to assess changes in muscle strength before and after. At the same time, there are important reference values for muscle training methods, muscle contraction types, muscle strength and training posture selection. Surface electromyography (SEMG) can measure the electrical activity of skeletal muscles during contraction, and reflects the impulse generation and activation characteristics of the muscle system through its amplitude and waveform characteristics. But not all muscle fibers of the muscle are involved in contraction of different strengths and types of exercise, but a certain number of muscle fibers are used as a group. Different numbers of muscle fibers will regularly participate in exercise, and the state of the muscles is contracted or not

expanded [5]. The increase in EMG amplitude indicates that the number of muscle fibers involved in contraction increases. The average amplitude (MA) is not sensitive to different periods of the analysis period and is suitable for comparative analysis [6]. Studies have shown that the central nervous system of the human body has bilateral innervation properties of the proximal muscles of the upper limbs, but under normal circumstances, it cannot be expressed due to the theory of interaction inhibition. Diseases of the cranial nervous system cause the brain to control the contralateral limbs. This mechanism can be activated and the ipsilateral limb is innervated by the ipsilateral brain [7]. The joint drive model based on this theory is a central motion control method for human muscle activity and has received attention in recent years. The performance of unilateral limbs, joints, bilateral limbs, and whole-body muscle activity will be studied to discuss the important theoretical basis for coordinated control of human movement. A common driving theory states that, when human muscles complete subjective movements, the central nervous system performs overall regulation of the activities of motor units belonging to the same pool of neurons. The study of co-driving theory begins with the consistency of the excitatory excitation frequency of each motor unit in the same muscle. Subsequent researchers found that the frequency of excitatory discharges of active and antagonistic muscles in the completion of common tasks also continued. This is the principle of joint drive control at the limb level. It is the joint control of muscles of the same name on both sides of the body.

## **2.2. Relationship between SEMG Signal Frequency-Domain Characteristics and Exercise Fatigue**

In general, with the gradual fatigue of exercise muscles, the spectrum curve of EMG signals of exercise muscles will shift to the left to different degrees, and then the MPF and MF values that reflect the frequency domain characteristics of EMG signals will decrease. The power of SEMG signal during fatigue in the deterministic aspect of the left shift of the spectral curve, it seems that the static exercise load is better than the dynamic exercise load for two reasons. First, because the muscle tissue has the property of a low-pass filter, when the muscle contracts dynamically, its length becomes shorter and its thickness increases, leading The relative distance between the measuring electrode and the measured exercise unit increases, so the high frequency components in the SEMG signal may be filtered out, which objectively causes the relative increase in the proportion of low frequency components, which causes errors in the experimental results; secondly, the muscles are completing the dynamic load At this time, the spatial position of the muscle and the measurement electrode is always in a relatively dynamic change process, plus factors such as the shaking of the connecting wire of the electrode sheet, so the collected SEMG signal may be polluted by noise. However, there are also different research results. Studies have shown that MPF and MF change under static isometric contraction of 10% to 80% MVC of triceps and elbow muscles. It is found that MPF and MF values are not affected by static load intensity. And in another study on the isochronous contraction of soleus muscle, lateral gastrocnemius muscle, and medial gastrocnemius muscle with 10% to 60% MVC static load, it was again observed that static load of different strengths had no significant effect on MPF and MF values. More research shows that in the medium or high-intensity static or dynamic motion, the frequency-domain indicators of the SEMG signal generally decline with different degrees of fatigue as the fatigue deepens, and the power spectrum is shifted to the left; while static isometric contraction-induced During muscle fatigue, the MPF or MF value decreases linearly with prolonged exercise time [8]. Regarding its mechanism of decline, the study first showed that it is mainly caused by muscle-derived metabolic factors, that is, it is related to the decrease of MFCV (muscle fiber conduction velocity) caused by H<sup>+</sup> accumulation.

At present, it is believed that the change in the spectrum curve of the SEMG signal has no definite relationship with the decrease of MFCV caused by the accumulation of peripheral H<sup>+</sup>. It may be more related to the change in the discharge frequency of the muscle fiber unit, and the decline in the frequency domain index is not necessarily related to local muscle fatigue. This kind of change reflects the regulation of spinal motor neuron activation rate by the cerebral cortical motor center through the analysis of the feedback information of proprioceptors in muscles, tendons and joints, which is estimated to be an active inhibitory regulation of the central nervous system Model, as for why the central system adopts this model remains to be studied. In the muscle, the action potential can be rapidly transmitted to the entire muscle fiber through the muscle fiber membrane and cause the muscle fiber to excite and contract. When this change occurs on all muscle fibers, it causes the entire muscle to contract. Electromyography is the process of muscle cell action potential change during muscle contraction, which is collected by electrodes and recorded by instrument amplification and filtering. It can reflect the contraction intensity, contraction time and discharge sequence of each muscle involved in the work.

### **2.3. Related Concepts and Definitions of Basketball Awareness**

The formation of basketball consciousness has certain laws of objective development. It takes a long process to form something, and basketball awareness is no exception. In the long run, systematic scientific training and softening in many practical basketball games have formed a system of accumulated experience and knowledge [9]. As basketball players develop basketball skills and tactics, they will eventually develop a basketball awareness that suits their characteristics. It can be concluded from this that correct basketball consciousness is a technical manifestation subjectively, a process from judgment to selection, and objectively a process of practice. Therefore, many outstanding basketball players at home and abroad have discovered that their excellent performance in the game is very important for having the correct basketball awareness. Fully displaying the correct basketball awareness depends on the correct expression of the athletes' emotions, views and thoughts on basketball during training.

#### **(1) Concept of basketball awareness**

Basketball awareness is the backbone of basketball players' soul on the court, and is considered to be the skill of basketball players. The so-called basketball awareness refers to the special functions created by basketball players in the practice of basketball through the positive thinking process of the brain to correctly reflect the regularity of basketball. It is a collection of reflective behaviors with correct psychological and physiological functions. Basketball players have perfected and accumulated these reflective behaviors during their long-term understanding of basketball practice. In short, this is a subjective reflection of basketball players on the objective reality of basketball game rules.

#### **(2) Knowledge system**

The knowledge system includes the basic basic theoretical knowledge and application theory of basketball and basketball, development frontiers and trends, basic technology and tactical method principles, technical and tactical application rules, basketball rules and the knowledge base of referees. Today's basketball is changing with each passing day, and athletes' skills and tactics are constantly increasing. In high-level confrontation, knowledge becomes more and more important for improving athletic performance. To develop the technical level of basketball players, people need to support their basketball awareness. To improve the basketball awareness of athletes must be based on the driving factors of basketball awareness. It is planned to add correct basketball awareness to the training [10]. Looking back at the development of basketball, the intellectual training of basketball has become the most important part of modern scientific training content.

This can control the growth of athletes to the greatest extent. The development of intelligence actually depends on the accumulation of knowledge. Better use of the knowledge system possessed by athletes and the development of basketball IQ require the support of intelligent training, such as learning specialized technical knowledge. These methods effectively improve the basketball player's cultural literacy and improve the athlete's athletic ability.

#### **2.4. Rehabilitation Fitness Training Method for Rectus Femoris Tear of Basketball Players**

Prevention is the key to reducing the occurrence of sports injuries, and prevention can fundamentally reduce the occurrence of sports injuries. In this article, by understanding the sports characteristics of basketball, the knee joint in a semi-flexed position is the key to all technical work, and the knee joint at this time is also in the most unstable position of the joints and ligaments and their extension. Muscle strength is not adjusted. The lack of joint strength of the quadriceps muscles, which leads to joint instability, is the main reason for knee injuries. Therefore, the rehabilitation training of rectus femoris improves the stability of the core and joints, develops the muscle strength of the rectus femoris, balances the strength of other small muscle groups, and becomes the focus of rehabilitation training before and after training. To prevent knee joint injury, preventive activities are necessary auxiliary measures [11-12].

##### **(1) Stretching and relaxation before and after training**

Stretching before exercise is to increase the range of motion of joints and improve functional capabilities, while stretching after training is to relax muscles and reduce lactic acid accumulation. Stretch for 10-15 minutes before and after each exercise. The strength of the stretch should be chosen between discomfort and pain.

##### **(2) Strength development of rectus femoris**

The development of the strength of the rectus femoris reduces the pressure on the knee joint and is an important guarantee for knee stability. Common exercises for rectus femoris strength development are meditation, knee extension and flexion in the supine position, and sitting on an elastic band. When developing quadriceps, pay attention to the balance of muscle development. Training should vary from person to person, due consideration should be given to the athlete's athletic level and athletic status.

##### **(3) Exercise of knee joint stability**

Knee stability exercise can use stability training mats to do some one-leg balance training, one-leg knee bending and stretching training, one-leg micro-squat training, you can also use the two-way and multi-directional balance board to do some progressive balance training and specific basketball moves Balance training.

##### **(4) Strengthen the strength exercises of rectus femoris**

Post-injury training mainly includes static semi-squats and straight leg lifts, and you can perform static exercises for squats twice a day. The squat angle can start from 130 ° and gradually transition to 90 ° during the exercise. Each group of practice time is 3 to 5 minutes, gradually increase the squat time to relieve symptoms. Straight leg lifting exercises can be performed to suit people's muscle strength, but during exercise, please keep the knee straight and lift, the knee joint should be free of bending and stretching exercises, so the training intensity can be lifted from no load according to the relief of symptoms Change to weight-bearing.

##### **(5) Exercise of small muscle groups around the knee**

The elastic band is fixed at one end, and the other end is tied to the ankle of the exercise limb for resistance exercises of the adductor thigh and abductor muscles. Exercise 2-3 times a day, 8-15 each time as a group. Strengthen the calf triceps by standing and lifting the heels, practice twice a day, the number of each time is adjusted according to the injury.

### (6) Balance and stability exercise

People usually use bidirectional and multidirectional balance training boards for progressive balance training. In the first stage, gradually increase the affected limb by standing on the balance training board to maintain stability, close eyes, rotate and move the center of gravity. In the second stage, based on the completion of the first stage, resistance training on elastic bands will be added, and basketball-related pass, catch and shoot exercises will be practiced on the basis of maintaining balance. In the third stage, the balance training committee conducts some functional activity exercises, including exercises on the upper and lower balance boards. The method of rehabilitation physical training for basketball players with torn rectus femoris is shown in Figure 1:

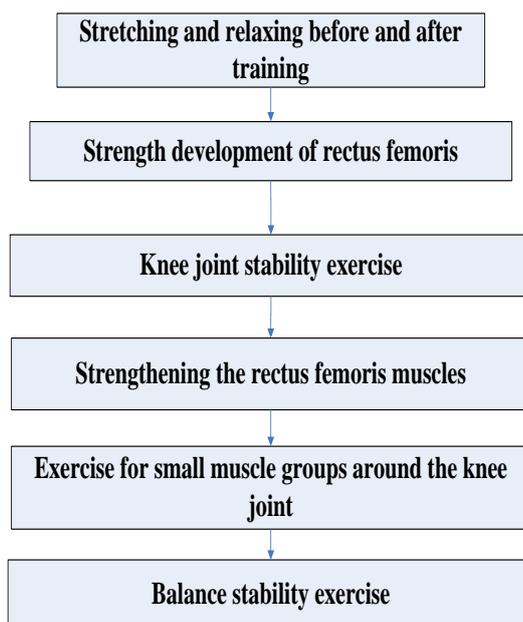


Figure 1. Rehabilitation fitness training method for rectus femoris of basketball player

## 3. Research Objects and Tools

### 3.1. Experimental Settings

(1) Subjects: 94 basketball players with rectus femoris tears, BMI of 20-24, average age:  $23 \pm 0.5$  years, average height: male ( $200 \pm 5$ cm), female ( $180 \pm 5$ cm) Player with torn rectus muscles. The subjects had no history of injury to the lower limbs, and did not exercise vigorously within 24 hours before the test to exclude the effects of residual fatigue caused by excessive exercise. Subjects signed informed consent.

(2) Experimental steps: 30 seconds STST is explained to the subjects by uniformly trained testers. The test was performed on a standard chair without armrests at a height of 46 cm. Subjects completed their maximum sitting and standing motions as fast as possible without hand support within 30 seconds, and recorded the number of sitting and standing motions. The measurement was repeated twice, and the subject was allowed to rest sufficiently between the two measurements.

### 3.2. Experimental Equipment

#### (1) Muscle strength measurement of quadriceps muscle strength

Tensiometer measurement of the quadriceps femoris method was performed according to the dynamometer instructions. Sit on a stable platform so that both legs are perpendicular to the ground,

with the knees bent at 90 degrees. Place the hand-held dynamometer test plane perpendicular to the long axis of the tibia at 85% of the leg length from top to bottom. Subjects are required to resist the dynamometer with maximum strength for 5 seconds. The measured maximum muscle strength is recorded in Newton (N). The interval between the two measurements was 30 seconds. The quadriceps muscle strength of the right leg was measured 3 times, and the maximum value was taken as the quadriceps muscle strength result.

#### (2) Rectus femoris ultrasound

Basketball players are required to have no strenuous exercise for 72 hours. After a quiet rest for 15 minutes, lie on their backs on an operating bed to relax their muscles. The researcher set a bracket to fix the ultrasound probe to reduce the deformation of the muscle due to external forces. The ultrasound probe was perpendicular to the long axis of the quadriceps femoris.

## 4. Evaluation and Data Test of the Laceration of Rectus Femoris in Basketball Players

### 4.1. Evaluation Results of Rectus Femoris Tear of Basketball Players

(1) A basketball player lays down on the knee cushion, so that the knee joint is naturally bent in a relaxed state, and the affected knee joint is exposed, using a push test (the doctor's two thumbs are superimposed, and the patella is pushed in six directions from the center, that is, the outer, upper, Outside, inside up, inside down, directly above, directly below, if the patient has pain or the doctor feels friction and other abnormal feelings, it is a positive push test. Find the pain point, and then look for the suspected muscle (normal function in the motor center). In the case of muscle relaxation, muscles still in pathological tension) and mark, 4 to 6 cm away from the affected muscle as the point of needle insertion, the needle point facing the affected muscle, push the needle parallel to the skin, hold the needle seat for flexible Sweep operation (referring to the action of the floating needle penetrating subcutaneously, holding the needle handle to make the needle body swing left and right under the skin like a fan-shaped action), and evenly dispersing for about 1 minute, the patient is instructed to perform reperfusion activities according to the function of the affected muscle (ie, force Concentric or eccentric contraction of the affected muscle, increased local or peripheral arterial pressure of the affected muscle, and then rapidly dilated the affected muscle, so that the blood flow velocity of the affected muscle is greatly increased than usual, which is conducive to the repair of the ischemic muscle) Then check the condition of the affected muscle, and adjust the position and direction of the needle tip according to the MTrP position, and then perform scatter and reperfusion activities. After the found affected muscle has basically disappeared and the patient feels that the pain has basically disappeared, the needle core is pulled out and fixed with a rubber strip. Needle handle of soft cannula, remove the soft cannula after 4-6h. The evaluation results of the rectus femoris tear of basketball players are shown in Table 1:

*Table 1. Evaluation result of rectus femoris tear of basketball player*

| Project                             | N  | Mean $\pm$ Standard deviation |
|-------------------------------------|----|-------------------------------|
| Number of patients enrolled         | 94 | -                             |
| Male (example)                      | 50 | -                             |
| Female (example)                    | 44 | -                             |
| Rectus femoris thickness            | 88 | 1.85 $\pm$ 0.23               |
| Rectus femoris cross-sectional area | 88 | 7.13 $\pm$ 1.37               |
| Quadriceps muscle strength          | 92 | 38.56 $\pm$ 12.30             |

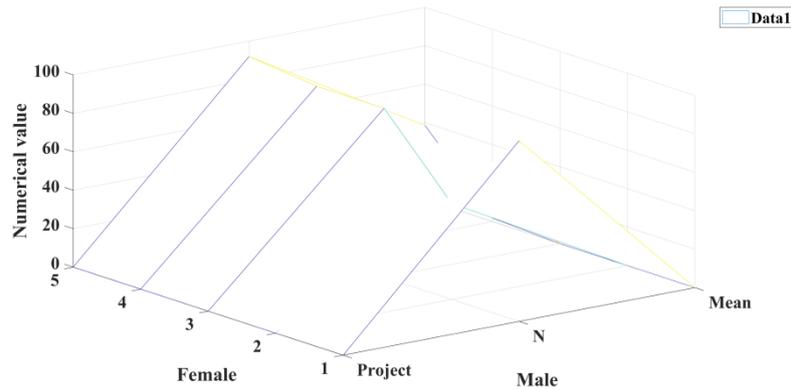


Figure 2. Evaluation result of rectus femoris tear of basketball player

In this experiment, five basketball players with a rectus femoris tear were selected to investigate the angle of flexion of the knee joint. Surface electromyography was used to record the EMG signals of the rectus femoris. Surface electromyography (SEMG), also known as dynamic electromyography, uses a recording electrode placed on the surface of the skin to record the current during muscle contraction, and obtains myoelectric signals through a series of technical processes. A non-invasive examination method to obtain related muscle function status. Since the surface electromyogram can test the electromyography of a certain muscle, the single muscle function can be evaluated. In this experiment, the electromyographic signals of the rectus femoris muscle at 0 °, 15 °, 30 °, 45 °, and 60 ° of knee flexion were collected, and processed in the order of MAV to obtain MA at various angles, and then verified by statistics. It is shown that the MA of five individuals in all angles conforms to the normal distribution. Experimental data show that the rectus femoris tear affects 20-30% of basketball players, and the average rectus femoris muscle strength is 25% lower than that of normal basketball players. The experimental data of muscle function is shown in Table 2:

Table 2. Experimental data on muscle function

|           | 0 °  | 15 ° | 30 ° | 45 ° | 60 ° |
|-----------|------|------|------|------|------|
| Subject 1 | 0.29 | 0.82 | 1.07 | 1.3  | 1.5  |
| Subject 2 | 0.15 | 0.62 | 1.1  | 1.28 | 1.33 |
| Subject 3 | 0.35 | 0.9  | 1.06 | 1.32 | 1.45 |
| Subject 4 | 0.41 | 0.98 | 1.23 | 1.45 | 1.7  |
| Subject 5 | 0.54 | 1.2  | 1.6  | 1.8  | 1.86 |

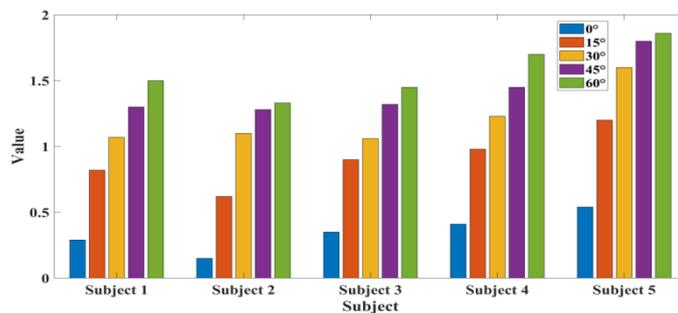


Figure 3. Experimental data on muscle function

#### 4.2. Test Whether the Data Follow the Normal Distribution

(1) Twenty rectus femoris muscles of 94 basketball players were clearly displayed, while the reflexed tendon was interfered by anisotropic artifacts, the echo was significantly reduced, and the rectus femoris abdomen was clearly displayed on the long-axis section. Kolmogorov-Smirnov test was used to test the normality of the obtained data. Calculate the thickness of rectus femoris, cross-sectional area of rectus femoris, and quadriceps muscle strength of basketball players  $P > 0.05$ , obeying the normal distribution. Gender, BODE score, FVC, FEV1 accounted for the percentage of expected value, FEV1 / FVC were all  $P < 0.05$ , and did not obey the normal distribution. Because the IC / TLC sample size is too small, it is not included in the data analysis. The normality test is shown in Table 3:

Table 3. Normality test

| Project                             | P     | N  |
|-------------------------------------|-------|----|
| Gender                              | 0.000 | 94 |
| Rectus femoris thickness            | 0.200 | 88 |
| Rectus femoris cross-sectional area | 0.066 | 88 |
| Quadriceps muscle strength          | 0.200 | 92 |

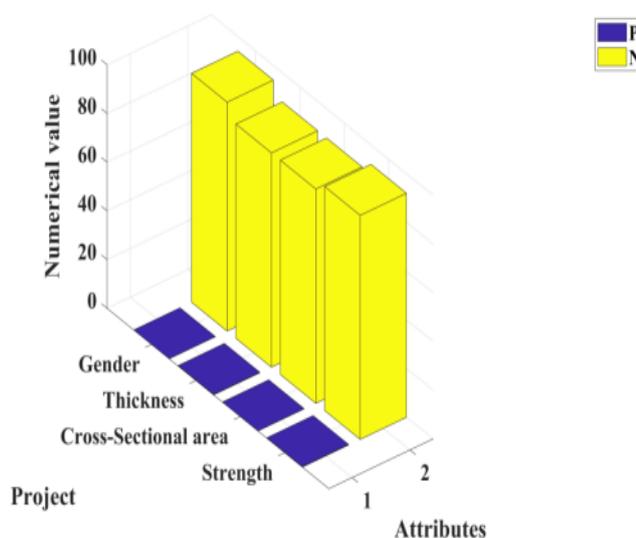


Figure 4. Normality test

(2) During the knee flexion of a basketball player in an upright position, the pressure on the articular surface is related to the knee flexion angle. The greater the pressure, the more likely the knee joint will be damaged. When the knee joint angle is 120-150 °, the rectus femoris muscle produces the greatest tension, and the medial and lateral collateral ligaments, anterior and posterior cruciate ligaments, and muscles on both sides of the knee are in a relaxed state. The stability of the knee mainly depends on the four heads of the femur. Muscle and sacrum are maintained, and the sacrum articular surface is under great stress. During the process of upright knee flexion of 60 °, the pressure on the knee joint surface is increasing. The relationship between the knee joint angle and the pressure on the articular surface is shown in Figure 5:

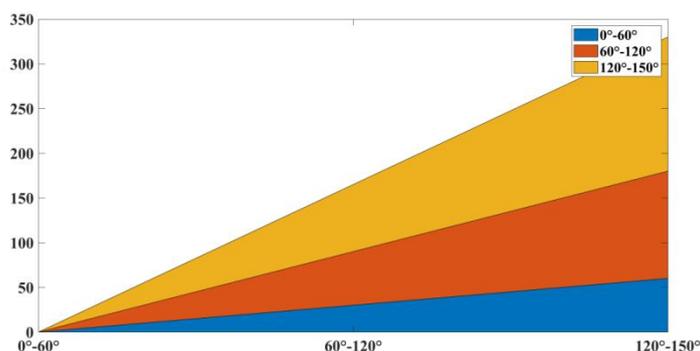


Figure 5. Relationship between knee joint angle and pressure on articular surface

## 5. Conclusion

(1) According to the experiments in this article, high-frequency ultrasound has high resolution and is the first choice for superficial tissue and muscle-related lesions. Especially in the case of muscle trauma, the exact location and extent of the injury can be identified to guide clinical diagnosis and treatment. The rectus femoris is the shallowest position of the quadriceps, and is suitable for high-frequency ultrasound examination. Clinical diagnosis shows that the location of the laceration of the rectus femoris muscle, in addition to the muscle tendon junction and the aponeurotic junction around the muscle fibers, there are a considerable number of patients with abdominal tears. In many cases, clinical diagnosis is not easy. Due to the unique muscle-muscle structure of rectus femoris, basketball players with rupture of rectus femoris have three muscle fiber-gliar junctions, which are considered to be atypical intramuscular fractures in most cases. It can be divided into several categories, usually occurring at the junction of central aponeurotic muscle fibers. The history of a complete rupture of the distal femoral muscle junction is clear. Contracture fractures usually result in obvious masses in the lower and middle thighs without the need for diagnostic diagnostic imaging. However, due to the tearing of the muscle fiber-tendon membrane junction, especially the muscle fiber-central aponeurosis junction, and no deep contracture, it is difficult to diagnose muscles clinically, and the anatomical features of high-frequency ultrasound combined with rectus femoris muscle are easy to diagnose.

(2) According to the analysis of the test group, the torque values corresponding to the MVC of basketball players are all knee joint angle 60° (this study follows the BIODEX multi-joint isokinetic training test system when the knee is extended to 0°) is significantly higher than the knee angle at 30° (Sig. = 0.000), indicating that when the hip joint is fixed at 90°, the knee is suitable for exercise. Within the range of joint angles, the rectus femoris muscle has an initial length more suitable for exerting muscle strength when the knee joint angle is 60° compared to the knee joint angle of 30°. At this time, the thick muscle filament of the rectus femoris muscle is combined with the actin of the thin muscle filament. The number of activated transverse bridges is greater, so the greater the pulling force generated by the swing of the activated transverse bridge, the greater the contraction force of the rectus femoris muscle fibers, and the greater the tension generated by the rectus femoris muscles in the sitting and extending knee contractions. In this paper, we know from experiments that the action potential is mainly caused by the outflow of muscle cell membrane into the membrane. The inflow of Na<sup>+</sup> causes a series of changes in the polarity and amplitude of the cell membrane potential. The sEMG signal recorded by the instrument is precisely the muscle cell membrane potential. The reflection of a series of changes, then the factors that affect the action potential should be able to affect the sEMG signal, so the factors that affect the flow of Na<sup>+</sup> and K<sup>+</sup> should be one of the reasons for the change of the SEMG signal.

(3)The experimental results of this paper show that the laceration of the rectus femoris affects 20-30% of basketball players, and the strength of the rectus femoris is 25% lower than that of normal basketball players. In different strengths and types of exercise, not a certain number of muscle fibers participate in contraction, but not all muscle fibers of the muscles participate in contraction, and different numbers of muscle fibers participate in work in an alternating and regular manner. Perform all or no contraction. The increase in EMG amplitude indicates that the number of muscle fibers involved in contraction increases. The average amplitude (MA) is less sensitive to different periods of the analysis period and is more suitable for comparative analysis. The rectus femoris has a unique muscle-muscle structure, based on the same muscle fiber-tendon connection point. The basketball players surveyed in this article can be divided into three categories according to the location of the muscle fiber-aponeurosis connection. In the past, atypical intramuscular tears occurred precisely at the junction of the central aponeurosis-muscle fiber. It is worth studying that when the central aponeurosis ruptures, the image of the peripheral muscle fibers of the rectus femoris is normal, which is the key to a clear diagnosis. Especially when the central tendon is completely ruptured, it is likely that the entire peripheral fibers of the rectus femoris muscle are mistaken for the muscles in the middle of the thigh, which is easily misdiagnosed as a complete rupture of the aponeurosis of the distal rectus femoris. In addition, in the process of ultrasound diagnosis, attention should be paid to the contrast scan on both sides to avoid missed diagnosis of rectus femoris rupture.

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### Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

### Conflict of Interest

The author states that this article has no conflict of interest.

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