Application of Isokinetic Muscle Strength Test and Training in the Sports Medicine

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Abstract: In the field of sports medicine, isokinetic muscle strength test and training technology (isokinetic technology) have been applied, and it is the most widely accepted technique to evaluate the muscle function. In this paper, the application of isokinetic technique in sports medicine is studied, and the application value of the constant-speed technology in the medical field is better reflected.

1. Introduction

At present, the research on isovelocity technology has made significant progress, and in recent years, the constant velocity instruments purchased by hospitals at all levels in China are increasing, which has been widely used in rehabilitation treatment and evaluation of muscle function of patients, and more experience in application of isovelocity technology has been accumulated, especially in the field of sports medicine.

2. Application in the Muscle Strength and Endurance Evaluation of Athletes

Muscle strength and endurance evaluation is the most basic application of isokinetic technology. Including physical examination, aerobic metabolism test, knee flexion muscle, extensor isokinetic muscle strength test and so on, through the related tests and tests, we can better understand the physiological and physical characteristics of human beings, and can help to basically understand their motor ability. Some studies have shown that [1] by testing the isokinetic muscle strength of swimmers, the results show that muscle endurance and aerobic metabolism are much stronger than those of ordinary people, after using the isokinetic technique, football players found that their knee isokinetic muscle strength was strong, and the muscle strength was also related to age. The isokinetic muscle strength of weightlifters was tested. The results of elbow joint, knee flexion and extensor muscle strength showed that the cross-cutting area of muscle increased by 30% $\leqslant$ 50%, and the muscle strength increased by 20% $\leqslant$ 50%. However, in the low speed test, it was found that the flexion muscle strength of elbow joint and knee joint of weightlifters was lower than that of ordinary people, but the extensor muscle strength did not change obviously. This difference shows that the cross-cutting area of muscle will affect the muscle strength.

3. Application in the Evaluation of Injury and Injury in Sports System.

Knee joint is one of the most important joints in human body, which belongs to load-bearing joint, and all kinds of sports are easy to cause knee joint injury. Therefore, all kinds of injuries and injuries of knee joint have become more and more studied in the field of medicine at present.

3.1 Evaluation of Muscle Function after Knee Joint Injury

The sports injury of the knee joint is of many types, most of which are the injury of the meniscus and the injury of the ligament, etc., and the isokinetic muscle strength test is carried out on the injuries, so that the function information of the muscle joint can be more comprehensively acquired, it has a positive help for the later development of rehabilitation training plan. For example, the

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anterior cruciate ligament is a key structure that ensures that the knee can remain stable and, once a lesion is present, reduces the stability of the knee and has an impact on the function. The isokinetic muscle strength test was carried out on the injured personnel of the anterior cruciate ligament, and the knee flexion and extensor muscle strength were found to be lower in different speed values, and the most obvious was the extensor muscle strength. Clinically used to There are many ways to improve the stability of the joint, and most effectively increase the strength of the muscles around the knee. Even if the anterior cruciate ligament injury, the knee extensor muscle strength decrease is especially obvious, with different degree of atrophy, but in the late stage through effective rehabilitation training, the peak moment ratio of the flexors and the extension muscle can be increased, and the stability of the knee joint can be enhanced.

3.2 Evaluation of Muscle Function after Ankle Sprain

As a common sports injury, ankle sprain is prone to a variety of sequelae, which is directly related to repeated sprain. Through the isokinetic muscle strength test of ankle sprain, it was found that the ankle flexion and back extension peak torque of these personnel were lower than those of healthy ankle joint, and the test periods were 160 °/ s and 50 °/ s, respectively. It can be confirmed that there is a direct relationship between ankle varus sprain and muscle strength weakening. Therefore, through the effective rehabilitation training of ankle muscles, the pain can be alleviated to the greatest extent, and joint atrophy can be avoided.

3.3 Evaluation of Trunk Muscle Function in Patients with Low Back Pain

In addition to the close relationship between joint muscle strength and maintaining body stability and normal physiological function, the size of trunk muscle strength is also particularly important. Low back pain can directly lead to the weakening of trunk muscle strength and muscle function, which is also the key cause of low back pain repetition. Some patients with low back pain were tested with isokinetic concentric and isokinetic centrifugal muscle strength, and the results were compared with those without low back pain. The results showed that the centrifugal and centripetal contractile forces of patients with low back pain were significantly lower than those without low back pain. It fully shows that the muscle strength of patients with low back pain is uneven. Moreover, the relief or recovery of low back pain can not improve the muscle strength, which shows that once low back pain occurs, it is necessary to cooperate actively with the treatment, and the systematic training of muscle is even more essential. as much as possible, we should carry out as much training as possible for the back and back muscles of the torso and gradually restore the muscle strength.

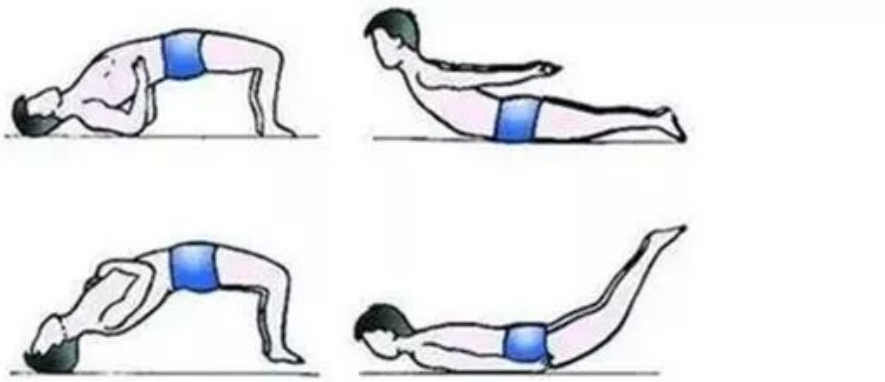

Fig.1 Schematic Diagram of Lumbar and Dorsal Muscle Training

4. Application in Prevention of Sports Trauma

In the course of the movement, some movement damage is more or less, and the correlation between various sports injuries can be further understood, and a set of effective methods for preventing and damaging the sports injury can be explored. By using the constant velocity technique, the correlation between different sports injuries can be well understood, especially in

relation to the occurrence of motion damage.

4.1 The Relationship between the Imbalance of Muscle Strength and the Movement Trauma

The planned training of muscle can improve the imbalance of muscle strength, effectively adjust the muscle state and prevent the decline of muscle strength, which has a positive impact on the prevention of sports injury.

(1) The ratio of active muscle to antagonistic muscle (H / Q) in knee joint. The normal H / Q ratio ranges from 50% to 70%, and the most accurate value is 60%. There are differences in this ratio among different people. For example, those who often engage in antagonistic sports have higher requirements for explosive force. At this time, the popliteal muscle group is more powerful, and its ratio to the quadriceps brachii is close to 1. If the anterior cruciate ligament is damaged, the unbalanced H / Q ratio will change the dynamics of the knee joint, which is very unfavorable to maintain the stable movement ability. Therefore, the key point of rehabilitation training is to improve the H / Q ratio and the hamstring strength.

(2) Shoulder-active/ antagonistic muscle ratio. As one of the more complex three-axis joints in the human body, the shoulder joint is to be included in the test, so that the shoulder function can be evaluated as a whole. The moment value of the internal rotation muscle is 60% ~ 80%, and the peak moment value of the extensor is between 70% and 80%. In that course of the exercise it is very possible to have an effect on the ratio of the muscle strength of the shoulder joint. It has been shown that[2], people who have long been engaged in the water polo movement, have lower joint external-rotation muscle peak moment ratio, and long-term swimming, the rowing sports personnel have a large joint extensor. The peak torque ratio of flexion muscle is lower than that of flexion muscle. Thus it can be seen that there will be differences in the muscle strength of shoulder joints in different sports.

(3) The muscle strength of bilateral limbs was different. There is no obvious difference in muscle strength between two sides of human, only when the joint is injured, there will be a great difference in muscle strength between the two sides. In general, the muscle strength on both sides of the person was divided into three grades, the normal difference was less than 10%, and higher than 20% indicated that there was a tendency to damage. The muscle strength of knee flexion and extensor muscle was tested in the personnel who had been engaged in football for a long time. It was found that many people had unbalanced muscle strength of both lower extremities, but there was no trauma in exercise. And through the test of tennis players and track and field players, it is found that the strength difference between the two legs is more obvious under the condition of fast movement. The difference in strength is more obvious. However, sports trauma can not be effectively prevented by simply maintaining bilateral muscle strength balance. In a word, there are still many disputes about the relationship between bilateral muscle strength imbalance and sports trauma.

4.2 Centrifugal / Concentric Shrinkage Ratio

The active muscle group is radially contracted so as to accelerate the limb, so that the normal muscle activity can be maintained, and in the process, the antagonism of the centrifugal work of the muscle group can slow the motion of the limb, and under the control of the two, the limb activity can be effectively coordinated, and the joint overload motion can be effectively prevented. If an uneven muscle centripetal contraction and an antagonistic muscle centrifugal contraction ratio occur, the load of the motor muscle group will be unbalanced, and it is very easy to cause a movement wound. After 60 days of rest, the muscle of the flexor muscle of the knee joint is tested and found, and the muscle strength is lower than that of the normal person. The test speed was divided into three, i.e.,30 °/ s,160 °/ s and 180 °/ s. It was also found in the test that the centripetal contraction force was significantly reduced during the slow test. Therefore, it can be preliminarily determined that the weakening of the contraction intensity of the flexor muscle can cause muscle damage, and this rule is especially obvious in the rapid movement. Therefore, in the related rehabilitation training, it is necessary to carry out effective flexo-muscle centrifugal contraction training.

5. Conclusion

In a word, as a new technology applied in the field of medicine, the constant-speed muscle strength test and training technology have been accumulated for many years, and it has some effect and value in the evaluation of muscle strength, function and muscle training. In the future, there is still a need for further research in constant-speed theory, technology, and so on to help people recover the ability to move more quickly.

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