FUNCTIONAL EXERCISE ON PATIENTS AFTER SPORTS MENISCUS INJURY

EXERCÍCIO FUNCIONAL EM PACIENTES APÓS LESÃO ESPORTIVA DE MENISCO

EJERCICIO FUNCIONAL EN PACIENTES TRAS LESIÓN DEPORTIVA DE MENISCO

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ABSTRACT

Introduction: Knee meniscus injury is a common sports injury, and minimally invasive surgery under knee arthroscopy has become an ideal method to treat meniscus injuries. This surgery rehabilitation has been improved, and several studies on the effects of functional exercise in the range of treatment are still inconclusive. Objective: Study the functional exercise rehabilitation effects in patients after sports meniscus injury. Methods: Twenty patients with meniscus-medial injury being operated on were selected, including eight men and 12 women. They were randomly divided into neuromuscular and strength training groups (11). Signs and symptoms were assessed before and eight weeks after treatment. JOA score indices and gait tests were compared. The impact of rehabilitation differences was evaluated in each group. Results: Eight weeks after rehabilitation in both groups, the scores of the strength training group were higher than the neuromuscular group; the difference between the groups was statistically significant (P<0.05). Conclusion: Functional exercise accelerates joint recovery, reflected in increased strength of adjacent muscles. The muscle and joint training effects on postoperative meniscus injury are worthy of recognition. The baropodometry revealed distinctions in walking patterns between different rehabilitation methods. From the perspective of this research, rehabilitation methods combined with proprioceptive exercises are complementary. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Meniscus; Athletic Injuries; Exercise.

RESUMO

Introdução: Lesão no menisco do joelho é uma lesão esportiva comum e a cirurgia minimamente invasiva sob artroscopia no joelho tornou-se um método ideal para tratar lesões no menisco. A reabilitação dessa cirurgia vem sendo aprimorada e vários estudos sobre os efeitos do exercício funcional no leque de tratamento ainda são inconclusivos. Objetivo: Estudar os efeitos da reabilitação com exercício funcional em pacientes após a lesão esportiva do menisco. Métodos: Foram selecionados 20 pacientes com lesão menisco-medial a serem operados, incluindo 8 homens e 12 mulheres. Divididos aleatoriamente em 2 grupos: grupo de treinamento neuromuscular e grupo de treinamento força (11). Sinais e sintomas foram avaliados antes do tratamento e 8 semanas após o tratamento, índices de score JOA e teste de marcha foram comparados, as diferenças do impacto da reabilitação em cada grupo foram avaliadas. Resultados: Oito semanas após a reabilitação dos dois grupos, os escores do grupo de treinamento de força foram superiores aos do grupo neuromuscular, a diferença entre os grupos foi estatisticamente significante (P<0,05). Conclusão: O exercício funcional acelera a recuperação das articulações, refletida no aumento da força dos músculos adjacentes. O efeito do treinamento muscular e articular na lesão do menisco pós-operatório é digno de reconhecimento. A baropodometria revelou distinções no padrão de marcha entre os diferentes métodos de reabilitação. Na perspectiva desta pesquisa, métodos de reabilitação combinados com exercícios proprioceptivos são complementares. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Menisco; Traumatismos em Atletas; Exercício.*

RESUMEN

Introducción: La lesión de menisco de la rodilla es una lesión deportiva común y la cirugía mínimamente invasiva por artroscopia de rodilla se ha convertido en un método ideal para tratar las lesiones de menisco. La rehabilitación de esta cirugía ha sido mejorada y varios estudios sobre los efectos del ejercicio funcional en el rango de tratamiento aún no son concluyentes. Objetivo: Estudiar los efectos de la rehabilitación con ejercicio funcional en pacientes tras una lesión de menisco deportiva. Métodos: Se seleccionaron 20 pacientes con lesión de menisco-medial para ser operados, incluyendo 8 hombres y 12 mujeres. Se dividieron aleatoriamente en 2 grupos: grupo de entrenamiento neuromuscular y grupo de entrenamiento de fuerza (11). Se evaluaron los signos y síntomas antes del tratamiento y 8 semanas después del mismo, se compararon los índices de puntuación JOA y la prueba de marcha, y se evaluaron las diferencias del impacto de la rehabilitación en cada grupo. Resultados: Ocho semanas después de la rehabilitación para ambos grupos, las puntuaciones del grupo de entrenamiento de fuerza fueron mayores que las del grupo neuromuscular, la diferencia entre los grupos fue estadísticamente significativa (P<0,05). Conclusión: El ejercicio funcional acelera la recuperación de la articulación, lo que se refleja en el aumento de la fuerza de los músculos adyacentes. El efecto del entrenamiento muscular y articular en la lesión postoperatoria del menisco es digno de reconocimiento.

La baropodometría reveló diferencias en el patrón de la marcha entre los diferentes métodos de rehabilitación. Desde la perspectiva de esta investigación, los métodos de rehabilitación combinados con los ejercicios propioceptivos son complementarios. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Menisco; Traumatismos en Atletas; Ejercicio.*

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INTRODUCTION

In recent years, knee meniscus injuries have become very common in football, basketball, badminton and other ball sports, because many people lack professional guidance, insufficient preparation activities, excessive exercise intensity, and some accidental injuries, can lead to sports injuries, at present, most of the sports activities that the public participate in are brisk walking, jogging, and ball sports, these exercises overload the knee joint, increased the prevalence of knee injuries.[1] The application of osteoarthritis arthroscopy, makes minimally invasive surgery gradually replace the traditional open surgery, used to treat severe knee meniscus injuries, however, the change in surgical methods, did not bring substantial improvement to postoperative rehabilitation, the postoperative rehabilitation effect is still unsatisfactory.[2] Therefore, postoperative rehabilitation becomes particularly important. Neuromuscular training is an effective way to restore the dynamic stability and motor function of the lower limbs, the training program is based on biomechanical mechanisms, its specific goal is to improve the sensorimotor function of such patients, targeted improvement of lower limb skeletal muscle strength. Based on some previous studies abroad, early and appropriate exercises can relatively reduce the load stress on the medial knee joint, improve the quality of cartilage, reduce the risk of osteoarthritis during future exercise.[3] In the field of biomedical engineering, Campo G and others believe that gait analysis, it has become a basic method and auxiliary tool to describe the characteristics of human movement.[4] At present, gait analysis has attracted the attention of researchers and clinicians.[5]

METHOD

Experimental subjects

A total of 16 patients were screened, aged 18-35 years, 8 cases of left and right knee injuries, among them, there are 6 males and 10 females. Randomly divided into 2 groups according to gender: Neuromuscular training group (Neuromuscular Training, NT) group and strength training (Strength training, ST) group. The two groups of general information are shown in Table 1.

All patients undergo JOA score and gait test before surgery, then he entered the Department of Orthopedics, General Hospital of the Military Region, and underwent arthroscopic meniscus resection. After being discharged from the hospital after surgery, go to the Sports Medicine Laboratory of the College of Physical Education, carry out rehabilitation training, and perform gait analysis test after 8 weeks of training.[6]

Functional training program

All postoperative patients were grouped into the following rehabilitation training.

ST group: 0-2 weeks after surgery, in addition to daily exercises of knee joint range of motion, hamstring stretch and skeletal loosening exercises, and do strength exercises for 20 minutes, including pumping exercises, quadriceps isometric contraction and straight leg elevation. Weeks 2-4: Train at least 5 times a week. In addition to knee mobility exercises and hamstring stretch, increase gait training and power cycling exercises; Strength Training, including closed chain exercises (squatting against the wall, going up and down steps) and open chain exercises (using elastic bands for quadriceps, hamstrings, skeletal abductors exercises and gluteal muscle progressive resistance exercises). Week 4-8: Closed-chain strength exercises (half squats, climbing stairs) and various open-chain strength exercises (including quadriceps, hamstring, skeletal abductor exercises and gluteus maximus isotonic resistance exercises).[7]

NT group: Same as ST group 0-2 weeks after operation. Weeks 2-4: Same as ST, add single-leg standing balance exercises.

Week 4-8: Standing exercises with one leg bend knees (and transition to exercises with a balance board), various closed chain exercises (half squats, cross-step exercises, front and back/side up and down steps, front and back/sideways lunge exercises, single-leg jump), open chain strength exercises (including quadriceps, hamstrings, skeletal abductor exercises and gluteus maximus resistance exercises, and gradually cross to the bus ball) and "8" running.

Test method

After all patients were admitted to the hospital, perform JOA score and gait test before surgery, the test was repeated in the 8th week of postoperative recovery. JOA score: Evaluate the subjects' walking, going up and down, knee flexion and swelling.

Statistical methods

Using SPSS 20.0 statistical software, the measurement data of the patient's general condition adopts autopsy. Pain and function scores and gait analysis indicators, all are expressed in the form of mean ± standard deviation ($X \pm S$), a two-way analysis of variance test was used for statistical analysis, and $P<0.05$ indicated that the difference was statistically significant.

RESULTS

Meniscus JOA score

From the results in Table 2, it can be seen that the improvements in all aspects of the two groups are statistically significant ($P<0.05$), but the effect of NT group is better than ST group.

As can be seen from Table 3, before therapy, comparing the percentage of stress time in each area of the soles of the two groups with that after 8 weeks of treatment ($P>0.05$), the difference is not significant, no

Table 1. Comparison of general information of the two groups of patients.

Group	gender		Age (y)	Course of disease (month)
	male	female		
NT group	3	5	24.26±5.35	2.74±1.84
ST group	3	5	25.78±6.13	2.24±1.57

Table 2. Evaluation of knee joint function before and after treatment (JOA score).

Project	NT group		ST group	
	Before the treatment	After treatment	Before the treatment	After treatment
Walking	20.38±4.12	26.57±2.53	21.37±4.32	26.5±4.31
The stairs	15.13±3.56	18.35±2.59	16.23±4.28	22.5±4.56
Buckling	28.24±2.38	27.3±4.17	28.16±2.45	34.22±2.38
Swelling	6.5±2.33	9.67±2.76	6.57±2.31	8.34±2.31
Total score	70.6±11.25	81.23±6.03	72.53±8.13	95.33±11.15

significant improvement was seen in the two groups after treatment. The parameters of the single foot support period of the two groups before treatment were compared with those after 8 weeks of treatment (P>0.05), the difference is not significant, and the two groups have improved after treatment, and the NT group improved significantly compared with the ST group, but the difference between the two groups before and after treatment and between the groups, no significant changes were seen (P>0.05).[8] The step angle before and after treatment in the NT group was reduced compared to before treatment, however, the ST group is not obvious, and there is no significant statistical significance in the two groups before and after treatment, however, the difference between the two groups was significant (P<0.05). There was no significant difference in the peak plantar pressure between the two groups (P>0.05).

Gait index above NT group, although there is still a certain gap compared with the normal value, but judging from multiple gait measurement data, there have been further improvements in many indicators, especially the improvement in step angle, the NT group was significantly better than the ST group. In the support period, the distribution of time and the percentage of time in each area of the sole of the foot are considered, there was no significant improvement in both groups. It may be due to their own inherent walking style is different, it may also have fewer participants, not long enough treatment time is related.[9]

As can be seen from Figure 1, M1 and M2 areas of patients with left or right knee joint meniscus injury, and the M4 and HL areas of patients with left knee joint meniscus injury (P<0.05), the control of peak plantar pressure is significant.

Various knee meniscus injuries, lead to a certain difference in gait parameters, but compared to normal adult gait test results, it is confirmed that unstable factors exist in patients after knee meniscus injury. Gait characteristics of patients with knee meniscus injury, as can be seen from many reports at home and abroad, there are certain differences in various indicators, at the same time, it has a certain degree of regularity, and there are many factors that affect gait, when we conduct research and design, it is required to exclude various other factors. But there are still shortcomings, because people are affected by the subjective conscious control of the brain when walking, the test results may have certain deviations, it is also affected by cadence and pace, these cannot be completely consistent in every subject. Usually before the test, it takes repeated practice to reach the standard, the accuracy of the completed test, in this project, 20 patients with knee meniscus injury after surgery, comparing the gait data with 10 healthy adults, it is preliminarily obtained that, after knee meniscus injury, the percentage of time that each area of the plantar is stressed, the stage parameters of the support phase of the single foot, the step angle, the peak pressure of each subarea of the plantar, etc., there are different degrees of differences between the indicators of healthy adults, and there is a certain regularity.

Table 3. Step angle before and after treatment.

Project	NT group		ST group	
	Before the treatment	After treatment	Before the treatment	After treatment
Step Angle	15.34±6.03	10.34±2.26	15.12±4.26	15.23±4.26

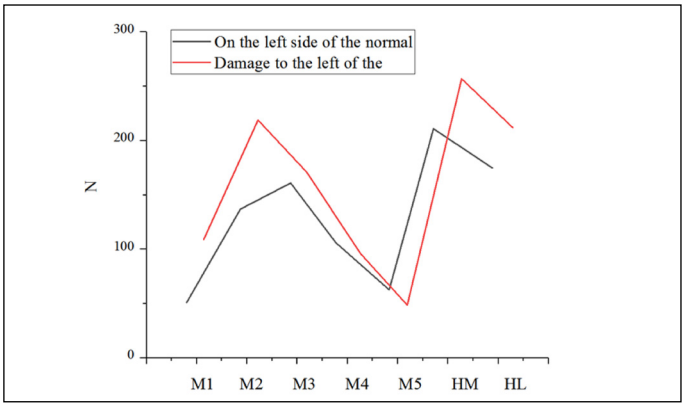

Figure 1. The peak pressure in each area of the plantar of a patient with meniscus injury.

DISCUSSION

Knee meniscus injury is a common sports injury and degenerative injury, with pain around the knee joint, snapping, joint locking, and quadriceps atrophy, as well as the main manifestation of the disease caused by weak legs. The ruptured meniscus is displaced, limit joint mobility, form a stutter, and the phenomenon of "twisting". Acute knee meniscus injury usually has obvious pain, swelling and joint effusion, limited joint movement. In the chronic phase, swelling and joint effusion are absorbed by themselves, the pain is still there, pain is obvious on the weight-bearing side of the knee joint, he may travel because of worsening pain, some patients may be locked, there is a buzzing sound during a certain flexion and extension activity.[10]

In the chronic phase, if conservative treatment is not effective and ineffective, feasible arthroscopy, clear diagnosis, at the same time, appropriate surgical treatment of the meniscus under the microscope, in order to prevent the appearance of traumatic arthritis. In order to prevent knee joint effusion after surgery, it is possible to stretch the knee and compress the bandage, start quadriceps functional exercise as soon as possible, such as static contraction exercise, straight leg elevation exercise, in order to prevent quadriceps atrophy, start walking down the ground two weeks later, normally functions can be restored within 2-3 months after surgery.

CONCLUSION

Functional exercise accelerates the recovery of joints, reflected in the increase in the strength of the muscles around the joints, speed up local nutrient metabolism exchange.The effect of muscle and joint training on the postoperative meniscus injury is worthy of recognition. Different training methods have different effects, from the perspective of this research, rehabilitation methods combined with proprioceptive exercises, it is more effective than using neuromuscular exercise alone. Using different exercise methods, the gait analysis indexes of patients after knee meniscus injury are different, each has its own characteristics.

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