

Analysis of rehabilitation effect of physical and medical fusion on anterior cruciate ligament injury in colleges and universities

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Abstract: In order to explore the influence of physical and medical fusion on the rehabilitation effect of anterior cruciate ligament injury in colleges and universities, 50 cases of anterior cruciate ligament injury in colleges and universities were selected as the research objects and randomly divided into two groups. The control group received conventional conservative medical treatment, and the observation group was combined with personalized exercise prescription rehabilitation training based on physical and medical integration on the basis of conservative treatment. Joint range of motion, Lysholm score and Tegner score were compared between the two groups after intervention. The results showed that the joint motion, Lysholm score and Tegner score in the observation group were better than those in the control group, with statistical significance ($P < 0.05$). It is suggested that physical and medical fusion is more beneficial to promote the rehabilitation of cruciate ligament injury in college, and it is worth recommending.

Keywords: college students; Anterior cruciate ligament injury; Physician-somatic fusion; Rehabilitation effect

1. Introduction

The anterior cruciate ligament, also known as the anterior cruciate ligament, is located in the knee joint and connects the tibia to the femur.^[1] There are several other structures in the knee, but they all work in concert with the ACL to keep the knee stable and support a variety of complex lower limb activities. In the state of sports, improper movement may cause body injury, and the lower limb injury is common. Knee joint is an important support structure in lower limb activities, and trauma may occur after long or difficult activities.^[2] For example, in high speed and confrontation sports, it is easy to cause anterior cruciate ligament injury, including valgus and hyperextension injury. In recent years, the amount of exercise of college students is generally not high, and ACL injury may occur due to improper activities during physical exercise or daily exercise.^[3] After diagnosis, conservative treatment or arthroscopic ACL reconstruction can be applied. However, early rehabilitation intervention after treatment has an important impact on the long-term prognosis of college students. Therefore, rehabilitation training has attracted more attention. The physical and medical integration mode lays an important foundation for ensuring scientific rehabilitation training. It specifically takes medical problems as the guidance, organizes safe and effective physical exercise, complements medical treatment, and plays a role in promoting the recovery of diseases or preventing the occurrence of certain diseases. In this study, 50 college students with anterior cruciate ligament injury were grouped and observed, aiming to explore the influence of physical and medical integration on their rehabilitation.

2. Data and methods

2.1. General Information

Fifty college students with anterior cruciate ligament injury were selected as the study objects and randomly divided into control group and observation group, with 25 cases. Control group: 16 males and 9 females; The age ranged from 18 to 23 years old, the mean age was (20.52 ± 1.67) years old; There were 12 patients with left knee injury and 13 with right knee injury. Observation group: 17 males and 8 females;

The age ranged from 19 to 23 years, the mean age was (20.48 ± 1.53) years; There were 11 patients with left knee injury and 14 patients with right knee injury. There was no statistical significance in the general data between the two groups, which was comparable.

Inclusion criteria: ① Confirmed by imaging examination; Injury of one knee; ③ Conservative treatment; ④ Sign informed consent. Exclusion criteria: ① combined with other orthopedic diseases of lower limbs; ② serious dysfunction of lower extremity after treatment; ③ the data were incomplete.

2.2. Methods

Control group: Conventional medical conservative treatment, the application of plaster or brace for external fixation treatment of the affected limb, external fixation was removed after 4-6 weeks. Before removing external fixation, appropriate knee flexion and extension exercises were instructed to prevent joint adhesion and stiffness.

Observation group: On the basis of control group, rehabilitation training based on personalized exercise prescription based on body-medicine integration was added, as follows:

(1) Deswelling and pain relief intervention: In the treatment process, the intervention was carried out according to the pain degree of the patient. The pain was severe and unbearable, and the analgesic drugs were applied to relieve the pain according to the doctor's advice. The slight pain was alleviated by distraction method and physical massage. After receiving treatment, it is recommended to apply ice to the affected limb about one week post-treatment. Additionally, elevating the lower limb properly can help alleviate pain and reduce swelling.

(2) Early Joint and Center of Gravity Transfer Training: Following treatment, initiate early joint mobilization with passive quadriceps and calf triceps muscle strength training. Incorporate proprioceptive training using a progressive resistance program, with sessions lasting 10 minutes each, once a day. Guide the patient in center of gravity transfer exercises, encouraging controlled body tilts in various directions followed by a return to the neutral position, also for 10 minutes daily. Provide demonstrations and guidance to ensure the correct use of crutches and facilitate proper gait training.

(3) Muscle strength training for 1 week after treatment: at this stage, the brace should be used for external fixation. When resting in bed, the corner pad should be placed under the affected limb, raised about 20° , and the ice cube should be assisted to cool down. In the absence of severe pain and abnormal functional disorders, rehabilitation training should be carried out as soon as possible. ① Try to flex and stretch the ankle slowly, keep for 5s under the state of hooking and stretching the foot, and repeat after resuming the position, 5 groups a day, 30 movements a week, depending on the patient's tolerance. ② Thigh muscle tension, maintain the state after 5s recovery, repeated, as many times a day to complete this action. ③ Push down the affected knee, tighten the muscles at the back of the thigh, and recover after 5s. The above training programs are carried out under the guidance of nursing staff.

(4) Muscle strength and knee joint activity training 2-5 weeks after treatment: continue to maintain muscle strength training, the same content as above, and increase knee joint training. ① supine position, toe hook, knee straight, slowly lift as far as possible to maintain a few seconds after recovery, 5 groups a day, each group of 15 actions. After the project can be adapted and easily completed, increase the weight, add appropriate weight sandbags to the ankle, gradually increase, alternate legs. ② Sitting position, legs naturally droop, extend the affected side knee joint, keep the movement for 5s to recover, 3 groups a day, each group of 10 actions. ③ Increase the height of the cushion under the ankle joint, remove the affected leg from the bed surface, relax and straighten, and keep the movement for 20min, twice a day. Supine position, heel close to the bed, slowly bend the hip, maintain the action after slight pain, bending after pain relief, slowly straighten to the maximum, 2 groups a day, 10 movements in each group.

(5) Functional training 6-12 weeks after treatment: maintain muscle strength training while increasing functional training. ① Straighten the affected limb, flex the healthy leg to support, promote the contraction of the lumbosacral muscles, support the head, elbow and healthy leg to the bed surface, support the abdomen and lift the hip, maintain 5s after recovery, 5 groups a day, 5 movements in each group. ② Standing position, back close to the wall, legs naturally separated, slowly bend the knees, keep the horse walking movement for about 1min, recover the movement, 2 groups a day, 5 movements in each group. ③ supine position, abdominal muscles tense, waist close to the bed, raise the head, to see the toes is appropriate, keep the action after 5s recovery, 5 groups a day, 5 actions in each group. ④

With the fixed object on the side of the body as an aid, support the hands to the aid, bend the legs to squat, maintain the center of gravity, keep the pain position for 1-2min after recovery, 3 times a day, 5min each time. ⑤ Walking activities, double crutches support, the affected leg forward, the center of gravity in the double crutches, the affected side is not bearing weight, and the foot is slightly on the ground. After removal of external fixation and significant improvement of knee joint function, independent standing and walking activities, the situation allows to increase swimming, short jogging and other activities.

2.3. Observational indicators

(1) Joint motion: Before treatment, 1 month after treatment and 3 months after treatment, the protractor was used to measure the joint flexion and extension Angle, including flexion and extension (0-130°), internal rotation (0-30°) and external rotation (0-40°).

(2) Knee function: Before treatment, 1 month after treatment and 3 months after treatment, the Lysholm score of knee joint was evaluated, with a total score of 100, and a high score indicated good functional recovery; Tegner score of knee joint was evaluated, including 10 knee joint motor ability actions, 1-10 points were recorded, high score was good functional recovery.

2.4. Statistical Methods

SPSS21.0 statistical software was used to complete the survey data processing, and the measurement data were described with ($\pm s$), expressed by t test, the adoption rate of counting data (%), and Chi-square test. $P < 0.05$ represented statistical significance.

3. Results

3.1. Comparison of joint motion between the two groups

Before treatment, there was no statistical significance in the joint motion of flexion and extension, internal rotation and external rotation in the two groups. One month after treatment and three months after treatment, the joint motion measurement results of the observation group were higher than those of the control group, with statistical significance ($P < 0.05$). (See Table 1.)

Table 1: Comparison of joint motion between the two groups [$(\pm s)$, °] \bar{x}

Groups	Number of cases	Flexion and extension			Pronation			External spin		
		Pre-treatment	1 month after treatment	3 months after treatment	Before treatment	1 month after treatment	3 months after treatment	Before treatment	1 month after treatment	3 months after treatment
Observation group	25	54.26 \pm 5.16	85.26 \pm 6.34	120.52 \pm 10.48	11.25 \pm 2.35	19.26 \pm 3.34	28.42 \pm 4.16	13.25 \pm 3.05	20.45 \pm 3.56	36.25 \pm 4.18
Control group	25	54.30 \pm 4.21	79.25 \pm 6.85	105.24 \pm 11.51	11.30 \pm 2.18	14.25 \pm 3.05	23.15 \pm 3.34	13.52 \pm 2.58	17.25 \pm 2.62	31.23 \pm 5.21
t	-	0.030	3.220	4.908	0.078	5.538	4.939	0.338	3.620	3.758
P	-	0.976	0.002	< 0.001	0.938	< 0.001	< 0.001	0.737	0.001	< 0.001

3.2. Comparison of Lysholm score and Tegner score between the two groups

Table 2: Comparison of Lysholm score and Tegner score between the two groups [$(\pm s)$, score] \bar{x}

Groups	Number of cases	Lysholm score			Tegner rating		
		Pre-treatment	1 month after treatment	3 months after treatment	Before treatment	1 month after treatment	3 months after treatment
Observation group	25	70.52 \pm 5.18	80.35 \pm 6.21	95.42 \pm 6.15	4.15 \pm 1.05	6.26 \pm 1.30	9.15 \pm 0.58
Control group	25	70.46 \pm 6.35	77.25 \pm 4.16	90.25 \pm 3.35	4.20 \pm 1.14	5.12 \pm 1.24	8.05 \pm 0.46
t	-	0.037	2.074	3.691	0.161	3.173	7.430
P	-	0.971	0.043	0.001	0.873	0.003	< 0.001

Before treatment, there was no statistical significance in Lysholm score and Tegner score between the two groups. One month after treatment and three months after treatment, the score of the observation

group was higher than that of the control group, with statistical significance ($P < 0.05$). (See Table 2.)

3.3. Discussion

College students participate in the daily exercise, tennis training, football and other processes, due to excessive activity or improper movement can cause limb injury, especially knee joint injury is common. For example, the movement process, the collision between the foot and the ground, external force interference, collision, etc., can cause knee ligament injury. Sudden deceleration, sudden stop, landing after jumping, etc., are easy to cause ACL injury. After the ACL injury occurs, it can cause severe pain in the knee joint, and it is accompanied by different degrees of mobility impairment. Due to local injury, the knee joint may be swollen or accompanied by blood accumulation in the joint. If the injury is serious, it affects the stability of the knee joint, which is manifested as unstable gait and joint shaking.

After the cruciate ligament injury before birth, college students should be treated by conservative or reconstruction immediately to avoid further aggravating the injury degree after activity, resulting in irreversible results. After medical conservative treatment, scientific rehabilitation training is of great significance to achieve early functional recovery and improve long-term prognosis. For example, in this study, the personalized sports rehabilitation training based on the integration of physical medicine has achieved remarkable results. The point of physical and medical integration is to formulate scientific rehabilitation training programs based on the actual conditions and under the guidance of medical problems, so as to serve the early rehabilitation goal.^[4] Furthermore, with the advancement of national sports initiatives, a primary focus on college students necessitates the integration model of physical medicine to ensure their sports safety. This involves leveraging common sports injuries and risk factors as foundational knowledge, guiding students to engage in sports activities under the supervision of effective medical expertise.

According to the analysis of the results of this study, before treatment, there was no statistical significance in the joint motion of flexion extension, internal rotation and external rotation of patients in the two groups. The measurement results of joint motion of patients in the observation group were higher than those in the control group one month after treatment and three months after treatment. Anterior cruciate ligament injury leads to limited knee joint movement, so the rehabilitation effect can be evaluated by joint motion. Under the guidance of the integration of physical medicine, the patient's ligament injury and related symptoms were evaluated, and effective means were adopted to reduce the pain and swelling symptoms early after the conservative medical treatment, laying a good foundation for the rehabilitation training as soon as possible. After conservative treatment, appropriate training methods were selected according to different time periods, and gradual rehabilitation training was carried out to assist and promote the recovery of ligament function, so as to improve joint motion. In addition, before treatment, there was no statistical significance in Lysholm score and Tegner score between the two groups, but all patients improved 1 month after treatment and 3 months after treatment, and the score of observation group was higher than that of control group. The above two items evaluated knee joint function from the two directions of pain and movement ability, suggesting that sports rehabilitation training under the guidance of physiotherapy integration has significant advantages in promoting the recovery of patients' joint function. For example, in the early stage after conservative treatment, through passive and active flexion and extension training, quadriceps atrophy can be prevented, muscle strength can be improved, joint activity training and resistance training can be gradually increased, and knee joint function recovery can be promoted. Systematic rehabilitation training can help nourish articular cartilage, relieve pain, and reduce the risk of joint capsular contracture and scar formation. After removal of external fixation and basic recovery of joint function, participating in short-range jogging and swimming training on their own is helpful to further strengthen the functional training effect and improve the long-term prognosis. In terms of the safety direction analysis, the selection of appropriate training items under the guidance of the integration of physical medicine will not significantly increase the joint load, therefore, generally will not worsen pain or joint injury phenomenon. In addition, early rehabilitation training can stimulate bone tissue repair after external fixation, improve joint stability and promote joint function recovery.

4. Conclusions

Cruciate ligament injury in college is mainly related to exercise, and can be treated by conservative or reconstructive surgery. After treatment, the recovery cycle is generally long, and it is necessary to cooperate with effective rehabilitation training to promote functional recovery, especially in patients with

external fixation and conservative treatment, muscle atrophy and joint adhesion and stiffness should be prevented. Through this study, it was found that the implementation of personalized exercise rehabilitation training based on the integration of body and medicine was helpful to promote the recovery of joint motion and knee joint function.

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