Project Name: Clinical Application of Portable Intelligent Multi Joint Isokinetic Training and Evaluation System Technology

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Sponsor: Qianfoshan Hospital

Responsible Party: Principal Investigator

Investigator: Ran Shi

Official Title: doctor

Affiliation: Qianfoshan Hospital

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1 Materials and Methods

1.1 General information

A total of 90 stroke hemiplegic rehabilitation patients who were hospitalized in the Rehabilitation Department of Qianfoshan Hospital in Shandong Province from January 2022 to January 2023 were selected, meeting the diagnostic criteria for cerebral infarction and cerebral hemorrhage in the 2007 edition of the Chinese Guidelines for the Prevention and Treatment of Cerebrovascular Diseases, and confirmed by cranial CT or MR examination; All of them are first-time onset, with a course of $\leqslant$ 1 month, and the lower limb of the hemiplegic side is classified as stage III or above. All participants signed an informed consent form. All patients have stable vital signs, stable condition, cooperative examination, no severe cognitive, visual, hearing impairment, no sensory aphasia, no orthopedic diseases, no lower limb muscle pain, no history of congenital diseases or other brain diseases, no history of organic or functional mental illness. Divide patients into a control group and a treatment group using a random number table method. There are 30 cases in the control group, 30 cases in the intelligent isokinetic treatment group, and 30 cases in the traditional isokinetic treatment group.

1.2 Method

Both the control group and the two treatment groups received conventional rehabilitation therapy such as exercise therapy (once a day,

40 minutes a time, 5 times a week), occupational therapy (once a day, 30 minutes a time, 5 times a week), low-frequency electricity (once a day, 20 minutes a time, 5 times a week), acupuncture and moxibustion therapy (once a day, 20 minutes a time, 5 times a week), which complied with the recommendations on rehabilitation treatment in the 2017 edition of the Guidelines for Early Rehabilitation Treatment of Stroke in China; Intelligent isokinetic therapy adds isokinetic muscle strength training to the lower limb flexion and extension muscles of hemiplegia in the above treatments. The intelligent portable isokinetic tester of this project team was used for isokinetic training of the affected knee flexor and extensor muscles. The patient's seat backrest was adjusted to 85 ° , and the waist and shoulder cross straps were fixed. The proximal thighs of the test subjects were fixed with nylon buckles, the lateral condyle of the femur was the axis, and the length of the arm was 12 on the scale. The distal ankle of the lower leg was fixed above the ankle. Before training, passive joint movements were performed on the knee and ankle joints to avoid joint damage, And conduct three low resistance warm-up exercises. Choose 60 ° /s, 90 ° /s, and 120 ° /s angular velocity isokinetic training based on the patient's specific situation. Train 10 times for each angular velocity, with 15 seconds of rest between each cycle, and 2 minutes of rest between each cycle. Train for 4 cycles according to the patient's tolerance, with an appropriate amount of training to cause

moderate muscle fatigue and no fatigue on the second day (a total of 25 minutes per training session). Train each muscle group once a day, 5 days a week, for a total of 3 weeks. The control group received 110 minutes of daily training, while the observation group received 135 minutes of daily training. Traditional isokinetic therapy has the same treatment parameters as the intelligent isokinetic group in this project group.

1.3 Evaluation method

Before and after treatment, a dedicated person is assigned to assess whether the patient is in the control group or treatment group, which is a third-party blind assessment. Evaluate lower limb motor function using the Fugl Meyer method (total lower limb motor score 34 points, total balance score 14 points). Muscle strength, muscle tone examination, motor function, and self-care ability scores. And record the peak torque (PT) at an angular velocity of 60 ° /s. The reason for choosing this angle is because most of our subjects find it difficult to produce faster movements. PT refers to the maximum torque output generated by muscle contraction, representing the maximum muscle force generated by muscle contraction, in N · m. In isokinetic muscle strength testing, the PT value has high accuracy and repeatability, and is considered the golden indicator of isokinetic muscle strength testing. It has high repeatability, and the peak torque measurement of knee joint flexion and extension is particularly stable. At the same time, a satisfaction questionnaire survey

was conducted on the use of different isokinetic methods, quantifying the characteristics of the two types of isokinetic methods based on the results: the survey content includes patients' comfort, satisfaction, and treatment effectiveness; Therapist: Conduct statistics on operability, learning curve, economy, and other aspects.

2 Statistical analysis

SPSS 23.0 software was used for data statistical analysis. The measurement data is represented by the mean ± standard deviation, the inter group comparison is performed using one-way analysis of variance, the pairwise comparison between groups is performed using LSD test, the mean comparison between two samples is performed using t-test, and the rate comparison of categorical data is performed using chi square test. $P<0.05$ indicates a statistically significant difference.