

Evaluation of supplementing active peptide's effect on recovering skeletal muscle micro-injury after track and field exercises

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Abstract: To explore the effect of supplementing active peptide on recovering skeletal muscle injury after track and field exercises. Method: choose 80 patients (contain teenagers) with skeletal muscle micro-injury after the track and field exercises from March 2015 to July 2016, divide them into two groups. Normal treatment of micro-injury of skeletal muscle is given to the control group while active peptide is supplemented to the experimental group based on normal treatment. Compare the two groups to find the differences in relevant indexes of skeletal muscle after track and field exercises. Result: Patients with micro-injury of skeletal muscle after track and field exercises may have inflammation at the early stage, so they need a long time for recovery. Relevant indexes of the experimental group after the treatment of supplementing active peptide are better than those of the control group ($P < 0.05$). Conclusion: To supplement active peptide can promote the synthesis of protein, which is conducive to the recovery of micro-injury on skeletal muscle and reduce the extravasations of creatine kinase in the cell, so as to improve the patients' anti-fatigue ability and endurance level.

Keywords: Active peptide, skeletal muscle, micro-injury, recovery.

INTRODUCTION

Skeletal muscle is the power organ of human body in exercises, and micro-injury on skeletal muscle is the process of increasing muscles. Muscle soreness and other symptoms occur in patients with skeletal muscle micro-injury in a short time after exercise, the patient's laboratory and physical examination, including touch tenderness, muscle stiffness, serum creatine kinase increased touch tenderness, muscle fibers scattered necrosis, degeneration, Inflammatory cell apoptosis and infiltration, cell membrane damage and Z disk tear and other changes. Exercise-induced skeletal muscle damage occurs mainly in cyclical endurance projects, patients with repeated exercise due to muscle fiber damage occurs. Skeletal muscle damage can also occur after the track and field, if the patient has serious muscle damage, it will lead to loss of motor function in patients, if patients with muscle damage, but also reduce the protection of bone and joint function, increased bone Injury and joint injury.

In order to reduce post-exercise skeletal muscle damage and promote its repair, reduce the negative impact of pain in patients with movement, people use a variety of intervention methods to intervene, not contrary to the case of sportsmanship, based on dietary fiber to provide patients with various supplements, with a view to patients with micro-injury of skeletal muscle repair.

Active peptides are characterized with low energy consumption, fast absorption and difficult to saturation of

patients after exercise in the case of skeletal muscle injury and the appropriate supplement to the active peptide is conducive to the repair of skeletal muscle injury. Thus fatigue of patients can be alleviated as soon as possible after exercise, and it will not increase the patient's gastrointestinal burden (Panz *et al.*, 2012, Hartwig *et al.*, 2014). The main bioactive peptides in this study are soybean protein powder, whey protein powder and so on. The main bioactive peptides in this study are soybean protein powder (Picoli *et al.*, 2010, Gajdosechova *et al.*, 2015), whey protein powder, whey protein powder, fresh milk and other raw materials through microbial fermentation and biological enzymatic hydrolysis, the degradation of macromolecular proteins, the formation of bioactive factors and small molecules of active peptides, which is more conducive to the absorption of patients, improve the patient's antioxidant capacity and immunity, thereby promoting Repair of micro - injury of skeletal muscle in patients. In this paper, we will analyze the effects of supplemented active peptides on the repair of skeletal muscle micro-injury after track and field.

MATERIALS AND METHODS

Basic materials

Choose 80 patients with skeletal muscle micro-injury after the track and field exercises from March 2015 to July 2016, randomly divide them into two groups with each group containing 40 examples. All the patients come from Xinan Hospital and the ethical number given by Ethical Committee of Xinan Hospital is 201605.

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In the experimental group, male-female ratio is 31/9 and the average age is (23.69±1.23), the average height is (172.36±4.20) cm and the average weight is (66.92±5.71) kg.

In the control group, male-female ratio is 30/10 and the average age is (24.03±1.31), the average height is (172.55±4.21) cm and the average weight is (66.71±5.82) kg.

All patients were in good health before the skeletal muscle was damaged and no patients were associated with respiratory and cardiovascular diseases.

Method

Normal treatment of micro-injury of skeletal muscle is given to the control group while active peptide is supplemented to the experimental group based on normal treatment. Neither patients of the two groups use other nutritional health products during the experiment period.

Observe indexes

Observe and analyze the two groups' cell microstructure, immunoreactions score, creatine kinase (CK), ethylene dioxamphetamine (MDA), 3-methylhistidine (3-MH), β -Glucuronidase (β -GUS), glucose-6-phosphate dehydrogenase (G6PDH) 72 hours after relevant interference.

Data treatments

All the data were analyzed by chi-square test, and the t-test was used to measure the data. For all the results, the case $P < 0.05$ is important statistically.

RESULTS

Changes of β -GUS and G6PDH at different periods after exercises

GUS and G6PDH levels were significantly higher than those before exercise ($P < 0.05$), and the levels of β -GUS and G6PDH were in a normal range before exercise ($P < 0.05$). At 48 hours after exercise, the levels of G-CSF and G6PDH decreased slightly, but still much higher than that before exercise ($P < 0.05$), and the levels of G6PDH were significantly higher than those before exercise ($P < 0.05$). The levels of beta-GUS and G6PDH did not recover to pre-exercise levels even after 72 hours of exercise, and there was even a slight increase. Skeletal muscle injury after track and field exercise in patients with early inflammation associated with the situation will take a long time to recover (table 1).

Immunoreaction score, CK, MDA, 3-MH, β -GUS and G6PDH

Skeletal muscle micro-injury patients received active peptide supplement, can inhibit the decline of skeletal muscle protein expression, inhibit the increase in serum MDA content and increased activity of CK, while patients

can exercise urinary 3-MH content of the situation. Active peptide supplement, while reducing the serum levels of β -GUS, G6PDH, play an anti-inflammatory effect, and thus better promote the recovery of patients with micro-injury of skeletal muscle, Results In the experimental group, the indexes of the patients with micro - injury of skeletal muscle were better than those of the control group ($P < 0.05$).

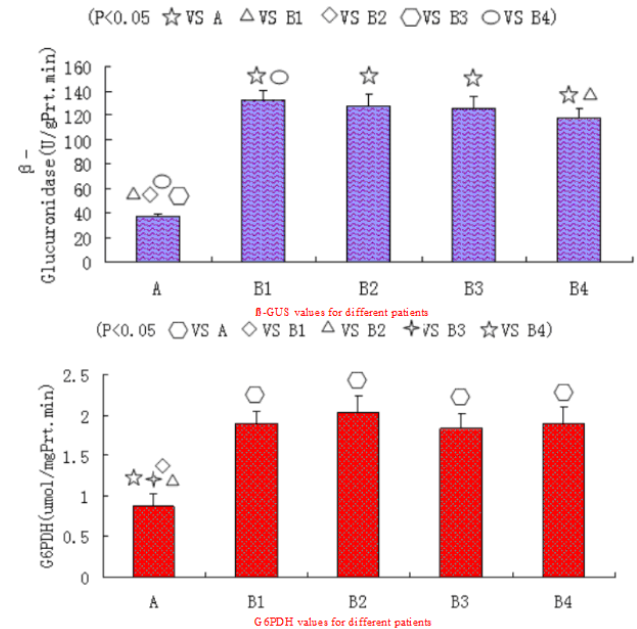


Fig. 1: (A) Before Exercise; (B1) Immediately after Exercises; (B2) 24 hours after exercises; (B3) 48 hours after exercises; (B4) 72 hours after exercises

Cell histological situation

Skeletal muscle damage in patients with active peptide supplement, which can ultra structure of skeletal muscle and cell microstructure abnormalities were inhibited, and can promote the skeletal muscle after exercise patients with abnormal microstructure recovery (table 3). The rate of abnormality of cell microstructure and abnormal rate of Z-line in the experimental group was significantly better than that in the control group ($P < 0.05$).

DISCUSSION

After exercise, the skeletal muscle in patients with ultra structural changes and significant changes in the structure of the structure, after exercise, the above changes will appear a certain delay and phase (table 1). In the early stages of skeletal muscle micro-injury, the site of injury in patients with inflammatory cell infiltration, interstitial vascular changes, then gradually appear muscle fiber degeneration, muscle swelling or necrosis of the situation (Maga *et al.*, 2013, Castellano *et al.*, 2013, Li *et al.*, 2012). The ultra structural changes were most obvious in the skeletal muscle after exercise for 34 hours. Skeletal muscle injury caused by exercise is not a complete

Table 1: Comparison of Two Groups' Changes of β -GUS and G6PDH during different periods after exercises ($\bar{x} \pm s$)

Group	β -GUS (U/gPrt·min)	G6PDH (umol/mgPrt·min)
Before Exercise	36.96±2.74	0.87±0.13
Immediately after Exercises	133.62±8.20	1.91±0.14
24hours after exercises	127.23±9.33	2.02±0.20
48 hours after exercises	125.63±10.20	1.82±0.18
72hours after exercises	116.24±7.96	1.91±0.18

Table 2: Index comparison of two groups of patients with skeletal muscle micro-injury after interference

Group	Experimental Group	Control Group
Number of Cases (n)	40	40
Immunoreaction score (IRS)	178.22±22.31*	125.69±33.51
CK (U/L)	563.21±185.36*	625.36±143.71
MDA (nmol/ml)	6.44±0.74*	7.78±0.95
3-MH (nmol/ml)	8.32±1.70*	9.67±2.16
β -GUS (U/gPrt·min)	77.52±8.02*	102.36±10.92
G6PDH (umol/mgPrt·min)	0.91±0.20*	1.61±0.30

Table 3: The comparison of the histological structure of the two groups after intervention ($\bar{x} \pm s$)

Group	Experiment Group	Control Group
Number of Cases	40	40
Rate of cell microstructure abnormality	0.56±0.18 (%)	0.86±0.28 (%)
Abnormality rate of Z-line	9.72(%)	10.81(%)

pathological process, may be the patient's skeletal muscle to adapt to the results of training to stimulate, between the pathology and physiology, the first dissociation, and then reconstruction may be the patient's skeletal muscle Adaptation of a process. G6PDH and β -GUS concentration can reflect the inflammatory response [5-7]. In the event of minor injury to the skeletal muscle after the athletic event, the inflammatory response associated with the patient may contribute to an increase in the level of β -GUS and G6PDH. In white blood cells, G6PDH has a higher activity. The levels of β -GUS and G6PDH were closely related to the degeneration of muscle fibers and the change of macrophage activity. Both the levels of β -GUS and G6PDH were higher, which indicated that the number of muscle fiber injury is also higher.

Peptides are hydrolysates of proteins. Peptide molecules are smaller than protein molecules, but their biological activity is high (Janet 2014, Huth *et al.*, 2015). Skeletal muscle micro-injury patients in the application of active peptide, can promote the regeneration of skeletal muscle microstructure and repair, after exercise in patients with active peptide supplement, can stimulate the synthesis of muscle glycogen and can provide anabolic skeletal muscle of a hormone environment. A sufficient amount of active peptide can maintain the body's positive nitrogen balance, the promotion of muscle growth, so that the strength of the muscles. Under normal circumstances, high-intensity and long after exercise, human skeletal muscle protein catabolism rate will exceed the rate of

anabolic, contraction protein if the net degradation of the state, will have a certain impact on skeletal muscle ultra structure, Resulting in patients with delayed muscle soreness and skeletal muscle injury. After exercise recovery period, human skeletal muscle protein degradation will appear to be inhibited, then protein synthesis began to strengthen. Skeletal muscle micro-injury patients received active peptide supplement after exercise, can increase the availability of amino acids in muscle cells, and promote protein synthesis, so as to provide patients with skeletal muscle repair and reconstruction conditions. Skeletal muscle micro-injury patients received active peptide supplement, can inhibit the decline of skeletal muscle protein expression, inhibit the increase in serum MDA content and increased activity of CK, while patients can exercise urinary 3-MH content of the situation. Active peptide supplement, but also can reduce serum β -GUS, G6PDH levels, play the role of anti-inflammatory, so as to better promote the recovery of micro-injury in patients with skeletal muscle, the patient's skeletal muscle ultra structure and cell microstructure abnormalities will be inhibited, to promote exercise after exercise in patients with skeletal muscle microstructure abnormalities of recovery is of great significance (Carlos *et al.*, 2014, Shahin *et al.*, 2013, Kim *et al.*, 2013, Kopesky *et al.*, 2014).

The results of this study show that patients with micro-injury of skeletal muscle, the early inflammation that occurs and the recovery time is longer. The reason may be

the patient in the exercise, the cell membrane permeability changes, making the cells into the calcium ion, calcium overload will inhibit the intracellular respiratory chain, so that patients with inflammatory reactions (Carlos *et al.*, 2014, Shahin *et al.*, 2013, Kim *et al.*, 2013). Skeletal muscle damage in patients with exercise, the Z line also appeared abnormal situation, see Table 3. After exercise, intracellular calcium ions are activated, making the skeletal muscle in patients with fracture, dissolution, disappears. The levels of CK, MDA, 3-MH, β -GUS and G6PDH were significantly different between the experimental group and the control group ($P < 0.05$), but there was no significant difference between the control group and the experiment group ($P < 0.05$) (table 2). In summary, the track muscle exercise injury in patients with skeletal muscle injury after receiving a high added value of the peptide can promote protein synthesis, promote the repair of micro-injury of skeletal muscle and shorten the rehabilitation time of patients.

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