Effect of rehabilitation exercise in combined with nutrition intervention on the postoperative rehabilitation after internal fixation of lower humerus fracture

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Objective: To explore the effect of rehabilitation exercise in combined with nutrition exercise on the elbow joint function after internal fixation of lower humerus fracture. Methods: A total of 80 patients with lower humerus fracture who were admitted in our hospital from July, 2014 to July, 2015 were included in the study and randomized into the intervention group and the control group. All the patients were preformed with internal fixation and given anti-infection, pain relieving, and anticoagulation treatments after operation. On this basis, the patients in the intervention group were given rehabilitation exercise in combined with nutrition exercise. The serum protein level 1 and 10 d after operation, and the elbow joint function recovery 12 months after operation in the two groups were compared. Results: The comparison of serum Hb, ALB, PA, and Ca 1d after operation between the two groups was not statistically significant. The serum Hb, ALB, and PA levels 10 d after operation were significantly elevated when compared with 1 d after operation. The serum Hb and PA levels 10 d after operation in the intervention group were significantly higher than those in the control group. With the extending of rehabilitation time, the various ROM of elbow joint was significantly increased when compared with before treatment. The total active motion of elbow joint flexion and extension, and forearm pronation and supination 3 and 6 months after follow-up visit in the intervention group was significantly superior to that in the control group. Conclusions: After internal fixation of lower humerus fracture, systemic rehabilitation and nutrition intervention should be taken as early as possible. Rehabilitation can effectively prevent the tissue adhesion around the joint, and promote the fracture healing and the recovery of joint function. Nutrition intervention can significantly improve the nutrition status, and is beneficial to the fracture healing.

1. Introduction

The humeral shaft fracture can be divided into the upper, middle, and lower humerus fracture according to different parts, among the lower humerus fracture is the most common. Due to the complex anatomic relationship, the joint is often involved after fracture; therefore, the treatment is difficult, and diaplasis and internal fixation are often required; moreover, the postoperative severe elbow joint dysfunction can cause a certain effect on the fracture healing if patients merged with diabetes[1]. With the increasing development of rehabilitation exercise, on the basis of anatomical replacement, reduction of soft tissue injury, and rigid fixation, early rehabilitation exercise can achieve a favorable effect on the recovery of elbow joint function[2]. The study is aimed to explore the effect of rehabilitation exercise in combined with nutrition exercise on the elbow joint function after internal fixation of lower humerus fracture.
2. Materials and methods

2.1. General materials

A total of 80 patients who were admitted in our hospital from July, 2014 to July, 2015 for internal fixation of lower humerus fracture were included in the study and randomized into the intervention group and the control group with 40 cases in each group. In the intervention group, 26 were male, and 14 were female; aged from 39 to 65 years old, with an average age of (39.5±2.8) years old; 20 had falling injuries, 8 had traffic accident injuries, 5 had falling injuries, and 7 had striking injuries. In the control group, 25 were male, and 15 were female; aged from 40 to 65 years old, with an average age of (39.8±2.7) years old; 20 had falling injuries, 7 had traffic accident injuries, 5 had falling injuries, and 8 had striking injuries. The comparison of the general materials between the two groups was not statistically significant (P>0.05).

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) those who had pure lower humerus fracture in one limb; (2) those whose X-ray showed that the counterpoint alignment of the fracture end was favorable, with a stable fixation; (3) those who had operation greater than 12 months. Exclusion criteria: (1) those who were accompanied by severe soft tissue, vascular, and nerve injuries, and were performed with nerve and vascular anastomosis, and collateral ligament remodelling; (2) those who had ulna nerve paralysis before treatment; (3) those who had cognitive disorders and were not willing to cooperate with the treatment.

2.3. Methods

All the patients were given routine treatments and performed with internal fixation of humerus fracture. The fracture end and its surrounding soft tissues and blood vessels were protected during operation. After operation, the patients were given anti-infection, pain-relieving, and anti-coagulation.

After admission, the daily calory for the patients in the intervention group was formulated. If the enteral nutrition supply was insufficient, the parenteral nutrition supplement was timely adopted. The reasonable rehabilitation plan was formulated, and the purpose and significance were informed to facilitate their positive cooperation. The postoperative rehabilitation exercise contained the following three stages: (1) passive function exercise: the exercise was initiated 1 week after operation and completed under the help of orthopedic and rehabilitation physicians. The intensity could be endured by the patients. The extorsion function of the affected limb was mainly trained. X-ray was reexamined after 2 weeks. After the fracture end internal fixation stability was confirmed, the anteflexion function exercise was performed in the guidance of physicians, and the extorsion function exercise was gradually strengthened in order to reach the goal of isometric muscular contraction of the affected limb. Exercise was performed 2-3 times every day, 20 min every time, for 5 weeks. During the exercise process, if the patients had obvious pain, the painkillers could be given in order to relieve the pain to cooperate with the rehabilitation treatment. (2) Active function exercise: the exercise was initiated 5 weeks after operation in that the fracture healing rate in this stage would be increased. Through the rehabilitation exercise at the first stage, the affected limb function was recovered to a certain extent. The rehabilitation exercise was initiated 5 weeks after operation, 1 time a week, for 6 months, including anti-resistance pronation, extorsion, elbow bending, and anteflexion extension exercise. The daily living activity exercise was also performed. The patients in the control group were only given routine treatments after operation.

2.4. Observation indicators

The serum Hb, ALB, and PA levels 1 and 10 d after operation in the two groups were compared. During the treatment process, X-ray was rechecked to grasp the fracture recovery.

2.5. Statistical analysis

SPSS 18.0 software was used for the statistical analysis. The
measurement data were expressed as mean ± SD, and t test was used. Chi-square test was used for the enumeration data. P<0.05 was regarded as statistically significant.

3. Results

3.1. Change of the protein indicators at each timing point in the two groups

The comparison of serum Hb, ALB, PA, and Ca 1 d after operation between the two groups was not statistically significant (P>0.05). The serum Hb, ALB, and PA levels 10 d after operation were significantly elevated when compared with 1d after operation (P<0.05). The serum Hb and PA levels 10 d after operation in the intervention group were significantly higher than those in the control group (P<0.05) (Table 1).

3.2. Elbow joint ROM in the two groups

The comparison of elbow joint ROM before rehabilitation between the two groups was not statistically significant (P>0.05). With the extending of rehabilitation time, the various ROM of elbow joint were significantly increased when compared with before treatment (P<0.05). The total active motion of elbow joint flexion and extension, and forearm pronation and supination 3 and 6 months after follow-up visit in the intervention group was significantly superior to that in the control group (P<0.05) (Table 2).

4. Discussion

The lower humerus fracture is the most common type of humeral fracture, is caused by direct or indirect violence, with elbow joint surface often being involved, and surrounding muscle, ligament, nerve, and vascular injuries being merged, and is often treated with external fixation or internal fixation after fracture reduction in the clinic[5]. The operation of manual reduction and external fixation is simple, but after reduction, a second replacement is easy to occur, which is difficult to guarantee the integrity of the joint surface, showing in the limitation of elbow joint function activity. After external fixation, the elbow joint activity is limited, the blood and lymphatic circulation is obstructed, resulting in periarticular fibrin deposition, tissue exudation, periarticular tissue edema, fibrosis, and periarticular adhesion, which can cause elbow joint dysfunction[6]. With the development of internal fixation, the internal fixation after lower humerus fracture reduction has been the main surgical method, especially for the elderly patients with osteoporosis; therefore, selection of the operation with small trauma, small effect on the joint function, and rapid postoperative recovery is of great significance, while diaplasis and internal fixation can reduce the surgical trauma, enhance the firmness and stability of fracture end, and avoid the second replacement[7,8]. After open reduction and internal fixation, the fracture end bleeding, and soft tissue injury can cause partial elbow joint dysfunction, and affect the normal living quality; therefore, no effective function exercise after operation is easy to cause joint adhesion, and affect the activity function[9].

The reasonable and effective function exercise and nutrition status are mainly involved to affect the joint function after internal fixation. No effective function exercise can block the periarticular blood and lymphatic circulation, and cause periarticular tissue edema and fibrin deposition, which can further induce joint stiffness and pain, and affect the joint activity function. Rehabilitation exercise, a reasonable, systemic, normative, and long-term rehabilitation plan formulated according to the patients’ own conditions, can promote an effective isometric contraction of the affected limb, and periarticular blood and lymphatic circulation in order to eliminate the inflammatory reaction, alleviate the local pain, enhance the joint ROM and flexibility, and promote the recovery of fracture and joint function[10,11]. It is reported by many references that early rehabilitation exercise after fracture surgery can effectively alleviate joint dysfunction, promote the development of osteoblasts around the fracture, contribute to fracture healing, and promote the recovery of limb function; therefore, reasonable rehabilitation exercise should be taken after internal fixation[12,13]. Some researches demonstrate that[14,15] poor postoperative nutrition status can produce a certain effect on fracture healing. The results in the study showed that the serum Hb and PA levels 10d after operation in the intervention group were significantly higher than those in the control group (P<0.05), indicating that reasonable nutrition intervention can effectively enhance the postoperative nutrition status, and contribute to fracture rehabilitation. Moreover, with the extending of rehabilitation time,
the various ROM of elbow joint was significantly increased when compared with before treatment \((p<0.05)\); the total active motion of elbow joint flexion and extension, and forearm pronation and supination 3 and 6 months after follow-up visit in the intervention group was significantly superior to that in the control group \((p<0.05)\), showing that rehabilitation exercise after internal fixation can effectively improve the elbow joint function, and contribute to fracture healing.

In conclusion, after internal fixation of lower humerus fracture, systemic rehabilitation and nutrition intervention should be taken as early as possible. Rehabilitation can effectively prevent the tissue adhesion around the joint, and promote the fracture healing and the recovery of joint function. Nutrition intervention can significantly improve the nutrition status, and is beneficial to the fracture healing.

References