Evaluation of the Effects of Exercise Therapy, Magnetotherapy, and Phototherapy on Improving Bone Mineral Density and Low Back Pain in Elderly Patients with Osteoporosis

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Abstract: Objective:To observe the effects of exercise therapy, magnetotherapy, and phototherapy on improving bone mineral density and low back pain in elderly patients with osteoporosis. Methods:Sixty-four elderly patients with osteoporosis admitted to our hospital from February to December 2024 were selected as the research subjects. They were randomly divided into two groups by the digital table method. One group (32 cases, the control group) received conventional drug treatment plus exercise therapy, while the other group (32 cases, the observation group) received conventional drug treatment plus exercise therapy, magnetotherapy, and phototherapy. The improvement of bone mineral density and low back pain in the two groups before and after treatment were analyzed. Results:After treatment, the lumbar spine bone mineral density and blood calcium level in the observation group were higher than those in the control group (P<0.05). Regarding the degree of low back pain, the pain score in the observation group after treatment was lower than that in the control group (P<0.05). Conclusion:For elderly patients with osteoporosis, exercise therapy combined with magnetotherapy and phototherapy can increase bone mineral density, relieve low back pain symptoms, and contribute to the recovery of patients.

Keywords: Exercise Therapy; Magnetotherapy; Phototherapy; Elderly Osteoporosis; Bone Mineral Density; Low Back Pain

1. Introduction

Osteoporosis is the most common and highly prevalent type among the elderly population. Its pathogenesis is complex, the disease course is long, and there is no specific treatment. It can cause symptoms such as low back pain and limited mobility in patients, which is not conducive to the normal conduct of their daily physiological activities. Although conventional drug treatment can rapidly relieve symptoms such as pain in patients, the overall treatment effect is not satisfactory[1-2]. The use of physical therapy for these patients has gradually been applied in clinical practice. This study mainly observed the specific effects of exercise therapy, magnetotherapy, and phototherapy in the treatment of elderly patients with osteoporosis.

2. Materials and Methods

2.1 General Information

Sixty-four elderly patients with osteoporosis admitted to our hospital from February to December 2024 were selected as the research subjects and randomly divided into two groups by the digital table method. One group (32 cases) received conventional drug treatment plus exercise therapy (the control group), and the other group (32 cases) received conventional drug treatment plus exercise therapy, magnetotherapy, and phototherapy (the observation group). In the control group, there were 17 males and 15 females, aged 61-79 years, with an average age of (66.23±1.73) years. The body mass index ranged from 21 to 25kg/m^2, with an average of (22.74±1.23) kg/m^2. In the observation group, there were 16 males and 16 females, aged 60-78 years, with an average age of (66.86 ± 1.68) years. The body mass index ranged from 21 to 25kg/m^2, with an average of (22.68 ± 1.45) kg/m^2. There was no significant difference in the basic data between the two groups (P>0.05).

2.2 Methods

oth groups of patients received basic drug treatment. They took Caltrate tablets, 10 mg each time, twice a day. The control group received exercise therapy based on drug

treatment: ① Aerobic exercise. Patients were instructed to perform at least 1 hour of aerobic exercise every day, mainly walking and jogging, or they could do 20 standing jumps according to their own tolerance, and gradually increase the amount of activity. ② Weight-bearing exercise. Before the exercise, patients were instructed to do a dumbbell-lifting test. They carried a weight equal to 50% of their maximum tolerance, with a single exercise duration of 1 hour, once a day. The observation group received magnetotherapy and phototherapy based on the treatment of the control group. A conventional magnetotherapy device in the hospital was selected, and the electrodes were placed 2 cm away from the patient's lower back. The treatment was carried out once a day for 30 minutes. Ultraviolet phototherapy was also performed, 30 minutes each time, once a day.

Both groups of patients were treated continuously for 4 weeks.

2.3 Observation Indicators

((1) Comparison of blood calcium levels and lumbar spine bone mineral density. Elbow venous blood was collected from the two groups before and after treatment. The blood calcium levels of patients were measured using an automatic biochemical analyzer, and the lumbar spine bone mineral density levels before and after treatment were measured using a single-photon bone densitometer. (2) Comparison of low back pain levels. The pain degree of patients before and after treatment was evaluated according to the Visual Analogue Scale (VAS) for pain. The score range is 0-10 points, and the higher the score, the more severe the pain symptoms of the patient.

2.4 Statistical Methods

All data in this study were analyzed by SPSS 25.0. Measurement data (including blood calcium levels, lumbar spine bone mineral density, etc.) were expressed as ($\bar{x} \pm s$), and counting data were expressed as percentages. The chi-square test was used. A difference with ($P<0.05$) was considered statistically significant.

3. Result

3.1 Comparison of Blood Calcium Levels and Lumbar Spine Bone Mineral Density between the Two Groups

After treatment, the lumbar spine bone mineral density and blood calcium level in the observation group were higher than those in the control group($P<0.05$), as shown in Table 1.

3.2 Comparison of the Degree of Low Back Pain

Regarding the degree of low back pain, the pain score in the observation group after treatment was lower than that in the control group ($P<0.05$), as shown in Table 2.

Table 1. Comparison of Blood Calcium Levels and Lumbar Spine Bone Mineral Density between the Two Groups ($\bar{x} \pm s$)

Group	Number of Cases	Blood Calcium Level (mmol/L)		Lumbar Spine Bone Mineral Density (mg/cm^2)	
		Before Treatment	After Treatment	Before Treatment	After Treatment
Observation Group	34	2.05±0.13	2.56±0.13	60.45±2.13	69.85±1.86
Control Group	34	2.06±0.12	2.13±0.11	60.35±2.23	64.35±2.01
t	-	1.857	8.452	1.915	28.045
p	-	0.415	0.001	0.275	0.001

Table 2. Comparison of the Degree of Low Back Pain between the Two Groups ($\bar{x} \pm s$)

Group	Number of Cases	Before Treatment	1 Week after Treatment	2 Weeks after Treatment	4 Weeks after Treatment
Observation Group	32	5.25±0.22	3.36±0.21	3.01±0.22	2.34±0.21
Control Group	32	5.31±0.15	4.98±0.34	4.15±0.18	3.56±0.18
t	-	1.255	14.478	18.648	20.045
p	-	0.628	0.001	0.001	0.001

4. Discussion

Osteoporosis is the most common disease type among the elderly population, and it has always had a high incidence in clinical practice. With the increase in the age of the elderly, bone mass is prone to different degrees of loss, which increases the probability of osteoporosis in patients, accompanied by symptoms such as low back pain and limited mobility [3]. There is

currently no specific treatment for this disease, and it is impossible to make patients recover in a short time. On the basis of conventional drug treatment for patients, timely treatment measures are needed to increase bone mass and relieve pain symptoms.

Exercise therapy is a commonly used treatment for elderly patients with osteoporosis in current clinical practice. By guiding patients to actively exercise every day, it can enhance muscle strength, improve the balance and coordination of patients, promote the recovery of damaged bone structure and bone mass, and increase the activity of osteoblasts [4]. At the same time, exercise can increase blood flow and promote calcium absorption, thus alleviating osteoporosis in patients. Magnetotherapy also has a certain application rate in the treatment of elderly patients with osteoporosis. Under the action of the magnetic field, it can stimulate the cell growth factors in bone tissue, regulate the local microcirculation, increase bone mineral density, and accelerate the recovery of damaged areas [5-6]. Under the action of phototherapy, regular ultraviolet irradiation treatment for patients helps to promote calcium absorption and enhance cell activity, thus improving osteoporosis symptoms. According to this observation, the patients in the observation group received exercise therapy, magnetotherapy, and phototherapy based on drug treatment. Their blood calcium levels and bone mineral density levels were significantly increased, and their low back pain symptoms were relieved, indicating that this treatment measure can increase bone mineral density, rapidly reduce pain symptoms, and contribute to the recovery of patients.

In conclusion, during the treatment of elderly patients with osteoporosis, exercise therapy combined with magnetotherapy and phototherapy can be carried out to increase bone mineral density, relieve low back pain symptoms, and help patients recover.

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