

Research Article

# Rehabilitation Exercises Combined with Foot Fumigation Massage in Community Patients with Diabetic Peripheral Neuropathy

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## Abstract

**Objective:** To investigate the effect of the application of rehabilitation exercise combined with foot fumigation massage in community patients with diabetic peripheral neuropathy (DPN). **Methods:** From September to December 2023, 50 patients with diabetes mellitus combined with peripheral neuropathy under the management of our community health were selected and randomly divided into the control group and the observation group on a 1:1 basis. The control group (n=25) was followed up routinely, and the observation group (n=25) was followed up with rehabilitation exercise combined with foot fumigation and massage interventions, comparing the changes in Michigan neuropathy screening scores, psychological status, and blood glucose levels before and after the follow-up period of the two groups. **Results:** Before the follow-up visit, the difference between the two groups in terms of changes in Michigan neuropathy screening scores, psychological conditions, and blood glucose levels was not statistically significant ( $P>0.05$ ). After the follow-up, the difference between the two groups in terms of changes in Michigan neuropathy screening scores, psychological status, and blood glucose levels was statistically significant ( $P<0.05$ ), and the improvement in the observation group was higher than that in the control group. **Conclusion:** The application of rehabilitation exercise combined with foot fumigation massage in community DPN patients has significant effect, which can improve the mood, facilitate the control of blood glucose level, delay the disease progression, and stabilize the physical and mental conditions of patients, and is worth promoting the application.

## Keywords

Rehabilitation Exercises, Foot Fumigation Massage, Diabetic Peripheral Neuropathy, Psychological Condition

## 1. Background

In recent years, the prevalence of diabetes mellitus is increasing year by year, and the risk of diabetic complications is high, which seriously affects the quality of life of patients [1]. Diabetic peripheral neuropathy (DPN) is a typical com-

plication of diabetes mellitus, which is related to the abnormal neurovascular function caused by nerve nourishment and hemodynamic changes under high blood glucose. The clinical manifestations of patients are varied, with pain and sen-

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sory abnormality as the main symptoms, which not only bring the patients a subjective experience of extreme pain, but also cause depression, anxiety, frustration and other negative emotions [2, 3]. The accumulation of negative emotions will lead to an increase in sympathetic nerve tone, which will increase the level of catecholamine hormones in the body, leading to spasm and contraction of small arteries throughout the body, and will also lead to poor blood glucose control, which will further aggravate the peripheral neurovascular disease [4]. Based on this, our community health club selects DPN patients under our care and conducts rehabilitation exercise combined with foot herbal fumigation massage intervention to explore its effects on the screening score of Michigan neuropathy, blood glucose index, and emotional and psychological aspects of DPN patients, and then analyzes the significance of its popularization and application in primary healthcare institutions.

## 2. Objects and Methods

### 2.1. Subject of the Study

From September to December 2023, patients with diabetes mellitus combined with peripheral neuropathy under the management of our community health were selected. Inclusion criteria: 1) Patients were conscious and complete. 2) Patients had informed participation and signed the informed consent form. Exclusion criteria: 1) other complications of diabetes mellitus. 2) Other causes of neuropathy. 3) Inadequate organ function. A total of 50 cases were included in the study by excluding the number of participants who could not participate throughout the study. The 50 patients were randomly divided into the control group (25 people) and the observation group (25 people), and the differences in the basic information of the two groups, such as gender, age, duration of the disease, smoking, alcohol consumption, etc. were not statistically significant,  $P > 0.05$  (Table 1), and were comparable.

### 2.2. Methodology

The control group was given routine diabetes follow-up instructions. The observation group was given rehabilitation exercise + foot fumigation massage on the basis of routine instruction. Rehabilitation exercise. Before the rehabilitation exercise, introduce the necessity, intensity, steps and precautions of the rehabilitation exercise to the patients. According to the actual situation of the patients, we chose the three-step exercise mentioned in a study in New Zealand [5], which is simple, reliable and easy to operate, and the patients are easy to adhere to it. The first step is to squat down, with the feet separated by the same width as the shoulders, the arms stretched forward, and the buttocks squatting backward, and the cycle of sitting down and standing up lasts for 20 seconds; the second step is to cushion the feet, stand up, put

the feet together, and raise the heel upward, and then slowly lower them downward, and the toes support the body for 20 seconds; the third step is to lift the knees, and then lift the feet upward. 20 seconds; the third step, lifting the knees and bending the hips, the body standing straight with hands folded, feet alternately lifting up, lasting 20 seconds; the above three steps for a total of 1 group, morning and evening each 3 groups. The whole process should be accompanied by family members to prevent adverse events. Foot fumigation massage. If the patient has local skin damage, etc. should be sterilized with povidone-iodine to prevent infection. If the patient has no obvious skin lesions, then the Chinese medicine fumigation. Chinese medicine fumigation formula composition: gypsum 5g, Zhimu 2g, Atractylodes macrocephala 3g, cypress 2g, hyssop 2g, Coix lacryma 5g, Poria cocos 3g, Lonicera japonica 3g, Paeonia lactiflora 2g, Cinnamon twig 2g, Gentiana macrophylla 2g, Loxylon chinensis 3g, Hai Tongpi 3g, Lulutong 3g, Di Long 2g, Duhuo 3g, Fenpeng 3g, Panax quinquefolium 2g, Glycyrrhiza glabra 2g, add water and decoct 500 ml of standby, the medicine and lukewarm water to join the Chinese medicine fumigation machine foot fumigation, each 30 min, once a day, continuous fumigation for 3 weeks. After the completion of fumigation, dry the feet, and apply essential oils, foot massage, selected points Taichong, foot Sanli, etc, with the thumb, forefinger joints force 3-5 times pressure, and then the palm of the large, small inter-fish muscle on the soles of the feet to the calf skin massage each time for 25 min, every 2 days to perform a time, 3 weeks of consecutive interventions.

### 2.3. Observation Indicators

Changes in Michigan Neuropathy Screening Inventory score (MNSI) and blood glucose indexes before and after the intervention were recorded for patients in the control group and observation group. Self-assessment scale for anxiety (SAS) and self-assessment scale for depression (SDS) were applied to evaluate the changes in psychological conditions of patients in the two groups before and after the intervention.

### 2.4. Statistical Analysis

SPSS 18.0 statistical software was used to analyze the data. Measurement data were described as ( $\bar{x} \pm s$ ) by t-test; count data were described as [n (%)] by  $\chi^2$  test.  $p < 0.05$  indicated that the difference was statistically significant.

## 3. Results

### 3.1. Basic Information on the Population

The differences in age, gender, and disease duration between the control and observation groups were not statistically significant,  $P > 0.05$  (Table 1), and were comparable.

**Table 1.** Basic information of the population ( $\bar{x} \pm s$ ).

	Control group (n=25)	Observation group (n=25)	P-value
Age (years)	57.33 $\pm$ 9.05	57.08 $\pm$ 8.39	0.475
Sex (male)	12 (48%)	13 (52%)	0.337
Duration of illness (years)	5.5 $\pm$ 2.57	5.67 $\pm$ 2.17	0.427
cigarette smoking	9 (36%)	10 (40%)	0.178
drinking wine	7 (28%)	6 (24%)	0.236

### 3.2. Comparison of Observation Indicators

By analyzing the data, it can be found (Table 2), before the intervention follow-up, the SAS, SDS score, MNSI score and fasting blood glucose of the two groups of patients were compared, there was no statistical significance,  $P > 0.05$ ; after the intervention follow-up, the SAS, SDS score, MNSI score and fasting blood glucose of the two groups of patients were significantly improved, and the magnitude of the improvement of the observation group was significantly higher than that of the control group,  $P < 0.05$ .

**Table 2.** Comparison of observation indexes before and after intervention follow-up in two groups of patients ( $x \pm s$ ).

Observation indicators	Control Subjects		Observation Group		$P_{pre-follow-up}$	$P_{post follow-up}$
	pre-follow-up	post follow-up	pre-follow-up	post follow-up		
SAS (points)	52.83 $\pm$ 6.87	49.58 $\pm$ 4.91 <sup>a</sup>	52.50 $\pm$ 6.09	44.42 $\pm$ 4.15 <sup>a</sup>	0.461	0.028
SDS (points)	54.42 $\pm$ 4.21	51.50 $\pm$ 3.20 <sup>a</sup>	53.75 $\pm$ 4.73	47.08 $\pm$ 2.53 <sup>a</sup>	0.378	0.005
MNSI (points)	6.58 $\pm$ 1.42	4.15 $\pm$ 1.27 <sup>a</sup>	6.67 $\pm$ 1.56	3.12 $\pm$ 1.35 <sup>a</sup>	0.238	0.004
Fasting blood glucose (mmol/L)	8.88 $\pm$ 0.92	6.33 $\pm$ 0.47 <sup>a</sup>	9.08 $\pm$ 1.08	5.73 $\pm$ 0.46 <sup>a</sup>	0.289	0.011

Note: <sup>a</sup> indicates  $P < 0.05$  compared with the same group before intervention follow-up.

## 4. Discussion

Diabetic peripheral neuropathy is a complication of high incidence in diabetes mellitus patients, which is mainly characterized by slow onset, insidious symptoms, and once aggravated it is difficult to be reversed, and it is also an important cause of foot ulcers and amputations. Therefore, actively preventing and treating diabetic peripheral neuropathy is of great significance to diabetic patients. There is a lack of effective treatment for this complication of diabetes, and symptomatic supportive treatment is the mainstay, which should be accompanied by effective interventions to further improve the prognosis of patients [6]. However, the conventional follow-up intervention content is single and the follow-up work is not targeted, resulting in unsatisfactory results. In clinical work, it is found that effective intervention can accelerate the patient's recovery, improve prognosis, and improve the quality of life [7, 8]. DPN belongs to the category of "thirst-quenching" and "blood paralysis" in traditional Chinese medicine, and its occurrence is related to limb dysfunction caused by poor blood flow, and its treatment should eliminate blood stasis and clear the channels, warm the body, and improve the quality of life. Its treatment should focus on

removing blood stasis, warming the meridians, warming the veins, and regulating qi and activating blood circulation. [9]. Traditional Chinese medicine fumigation is a traditional Chinese medical treatment method in which the steam from the decoction of traditional Chinese medicine is applied to the patient's skin surface, allowing the medicinal ingredients to be absorbed through the skin and act directly on the diseased area. [10]. Studies have shown that TCM fumigation can significantly relieve numbness, pain and other symptoms of patients and improve the therapeutic effect [11]. In the treatment of DPN, Chinese medicine fumigation usually uses herbs that have the effects of activating blood circulation, removing blood stasis, warming the meridians and collaterals, and nourishing yin and promoting the production of body fluid, etc. These medicines can promote local blood circulation, improve the blood supply to the nerve tissues, reduce the inflammatory response, and help to repair the damaged nerve tissues [12]. At the same time, foot fumigation massage can promote local blood circulation through thermal effect, which can help to relieve poor blood circulation in the lower limbs caused by neuropathy, reduce edema, improve oxygen supply to the tissues and metabolic waste elimination, and have a positive effect on reducing pain and numbness [13]. Rehabilitation exercises are a series of targeted physical activities to build muscle strength, improve joint flexibility, enhance

balance, and promote nerve regeneration and remodeling [8, 14]. For DPN patients, regular rehabilitation exercises can help to increase the nerve conduction velocity of the lower limbs, reduce muscle atrophy, improve gait, reduce pain, numbness and other sensory abnormalities, and improve self-care and quality of life [15]. Traditional Chinese medicine fumigation regulates from the inside, promotes local microcirculation and accelerates the absorption of medication, while rehabilitation exercise strengthens from the outside, enhances the functional recovery of muscles and nerves through physical activities, and the combination of the two can improve the condition in a more comprehensive way. Comprehensive intervention not only targets the physiological level, but also significantly improves the patient's psychological state and quality of life. The physical comfort brought by exercise and massage can reduce anxiety and depression, and enhance patients' confidence in fighting the disease and their ability to participate in daily activities. Although there are fewer studies directly on rehabilitative exercise combined with foot fumigation massage, the existing literature supports the positive effects of rehabilitative exercise with quality foot care, including foot massage, on patients with DPN [16]. The results of this study showed that after the intervention and follow-up, the SAS, SDS scores, MNSI scores, and fasting blood glucose of patients in both groups improved significantly, and the improvement of the observation group was significantly higher than that of the control group, indicating that rehabilitation exercises combined with foot fumigation and massage can improve the mood of patients with DPN, reduce the patients' blood glucose level, delay the progression of the disease, stabilize the patients' physical and mental conditions, and thus improve the quality of patients' survival.

## 5. Conclusion

The application of rehabilitation exercise combined with foot fumigation massage in community DPN patients has significant effect, which can improve the mood, facilitate the control of blood glucose level, delay the disease progression, stabilize the physical and mental conditions of patients, and is worth promoting the application.

## Abbreviations

DPN	Diabetic Peripheral Neuropathy
MNSI	Michigan Neuropathy Screening Inventory
SAS	Self-assessment Scale for Anxiety
SDS	Self-Assessment Scale for Depression

## Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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