

## Obvious Curative Effect of Taijiquan Exercise in Combination with Infrared Diathermy on Chronic Low Back Pain

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**Abstract:** Objective: Observe the curative effect of Taijiquan exercise in conjunction with infrared diathermy on patients with chronic low back pain. Methods: Select 64 patients suffering from chronic low back pain (including 34 patients with lumbar muscle strain and 30 lumbar disc herniation patients) and they are randomly divided into an observation group and a control group, 32 patients in each group respectively. The patients in the control group do the single Taijiquan exercise, while those in the observation group are treated by the infrared diathermy therapy besides Taijiquan exercise. Examine and compare their disease in the two groups before the treatment and after 3 months' treatment respectively. Results: After 3 months' treatment, VAS score of the two groups is significantly improved in comparison with that before the treatment,  $aP < 0.05$ ; the improvement effect of the observation group is more significant. In comparison with the control group after treatment,  $bP < 0.05$ . Additionally, upon evaluation and comparison of the clinical curative effect, it is found that the clinical cure rate of the patients suffering from lumbar disc herniation in the control group and the total effective rate are 6.67% and 66.67% respectively, while the clinical cure rate and the total effective rate of the patients suffering from lumbar muscle strain are 23.53% and 88.24% respectively; the clinical cure rate of the patients suffering from lumbar disc herniation in the observation group and the total effective rate are 20.00% and 80.00% respectively, while the clinical cure rate and the total effective rate of the patients suffering from lumbar muscle strain are 35.29% and 100% respectively; the clinical cure rate and total effective rate in the observation group are significantly better than those of control group. Conclusion: The simple Taijiquan exercise can significantly improve patients with chronic low back pain, but the short-term (3 months) Taijiquan exercise doesn't show the obvious effect on the lumbar disc herniation in comparison with its effect on the patients with lumbar muscle strain; if it is supported by the infrared diathermy jointly, it can further alleviate the pain of patients and improve their lumbar function and then significantly enhance the overall efficacy.

### 1. Introduction

Back pain is common disease among the middle-aged and elderly people and it can be induced by many causes. It can be divided into three types, that is, spine low back pain, the low back pain caused by paravertebral soft tissue disease and the low back pain caused by irritation of spinal cord and nerve root. Lumbar vertebral disc herniation in the spine low back pain and the lumbar muscle strain in the low back pain caused by paravertebral soft tissue disease are frequently encountered diseases[1-2]. The chief complaints of the patients are pain in back, lumbosacral and sacroiliac positions or it is accompanied by lower limb pain or radiating pain. The pain nature is hidden pain, dull pain, tingling, local tenderness or radiating pain. Their symptoms are shown as inconvenience movement, pitching, difficulty heavy-bearing and walking, limb fatigue, and even dysfunctions in waist flexion, extension and lateral bending. Such symptoms are seriously harmful to the patients' daily life quality [3-4]. In this study, based on the common low back pain symptoms among the middle-aged and elderly people suffering from lumbar disc herniation

and lumbar muscle strain, it suggests to adopt a therapy combining Taijiquan exercise with infrared diathermy auxiliary to treat 30 lumbar disc herniation patients and 34 lumbar muscle strain patients in the observation group. As a result, it is found that the combination therapy effect is obvious. The report is as follows.

## 2. Objects and Method

### 2.1 Study Objects.

The first hand data of low back pain patients is acquired from Ningbo Chengdong New District health service station and then it selects 30 lumbar disc herniation patients and 34 lumbar muscle strain patients who meet the practical research conditions. Their disease course lasts 2~12 months. Inclusion criteria: ①By referring to *Diagnosis and Curative Effect Standard for Traditional Chinese Medicine Symptoms* promulgated by China Administration of Traditional Chinese Medicine in 1994. The etiology of the patient is lumbar disc herniation or lumbar muscle strain; ② The middle-aged and elderly patients ranged from 45-60 years old; ③The patients voluntarily participate to the practice treatment on the premise of sufficient time. Exclusion criteria: ① Exclusion of the patients suffering from trauma, tumor, tuberculosis, fiber myositis, spinal cord or nerve root stimulation, and other organ diseases and back pain; ②Exclusion of those suffering from severe back pain, those in the acute period, those from limb dysfunction or mental disorder; ③ Exclusion of patients who are receiving other treatments and interfere with the practical data. The selected patients, caused by the above two etiologies, are divided into an observation group and a control group by a random numerical table method. Among 32 patients in each group, there are 15 lumbar disc herniation patients and 17 lumbar muscle strain patients. Basic data of the selected patients in two groups is compared in the statistical consistency aspect and no significant differences are shown between groups,  $P>0.05$ . It is comparable. See Table 1.

Table 1 Comparison of Basic Data for the Selected Patients in Two Groups( $\bar{x} \pm s$ )

Groups	Male/female (persons)	Age (Year)	Disease course (Month)	Pain etiology	
				LD	MS
Control group	17/15	53.12±5.05	5.71±3.20	15	17
Observation group	18/14	52.83±5.17	5.60±2.94	15	17

Note: “LD” represents lumbar disc herniation and “MS” represents lumbar muscle strain; comparing the two groups,  $P>0.05$ .

### 2.2 Treatment Methods.

The patients in the control group adopt Chen Tai Chi eighteen essential actions as their exercise content under the guidance of the professional coach. The patients do such exercise for 45 minutes once each afternoon and it lasts for 3 months. As for those in the observation group, they receive the infrared diathermy adjuvant therapy besides the above Taijiquan exercise. Infrared diathermy methods: use ZH-21infrared diathermy treatment instrument produced in China. Its rated power is 250W and pop range is 2um ~ 25um. As a tenderness point as a center, the wave acts on the affected area. The intensity of infrared irradiation is suitable when the patients feel warm and tingling on their body skin. The head of the instrument shall keep 40cm away from the skin. Each irradiation period lasts for 25min and one infrared diathermy treatment is provided every other day during 3 months. Note: when each infrared diathermy irradiation treatment is provided, appropriately adjust distance and time of the diathermy irradiation based on the tolerance of patients.

### 2.3 Evaluation of Curative Effect.

Before treatment and after 3 months’ treatment, respectively examine the illness of the patients in

two groups. (1) Use VAS scale(visual analogue scale) to evaluate the waist pain of the patients. The doctors advise patients to mark their pain on the straight line from left to right.0 indicates the painless; a score, less than 3.9 points, indicates mild pain; a score, 4-6.9 points, indicates moderate pain; a score, more than 7 points, indicates severe pain; a score, 10 points, indicates extreme pain. (2) Evaluate the curative effect by referring to *Diagnosis and Curative Effect Standard for Traditional Chinese Medicine Symptoms*. ①Back pain and stiff feeling of the waist disappear and waist can move freely, which can be deemed as cure; ②The pain is relieved obviously and a slight of stiff feeling remains in waist, while the waist motion is basically restored, which can be deemed as significant efficiency; ③The pain is mild, a slight of stiff feeling remains in waist or the waist motion function is disorder, which can be deemed as efficiency; ④The symptoms are not improved, which can be deemed as inefficiency.

## 2.4 Statistical Analysis.

Use SPSS19.0 statistical software to analyze data. The available data is expressed in ( $\bar{x} \pm s$ ). Meanwhile, adopt t-testing to compare the measurement data and  $\chi^2$  testing to compare the count data among groups and inter-groups before and after treatment. In case of  $P < 0.05$ , the difference has statistical significance.

## 3. Result

### 3.1 After Treatment, VAS Pain Score and Clinical Efficacy of the Observation Group are Significantly Better Than Those of the Control Group.

It can be known from Table 2 and Table 3 that after 3 months' treatment for the two groups of patients, VAS score of the control group is improved to ( $4.85 \pm 1.87$ ) from ( $6.49 \pm 2.11$ ) evaluated before the treatment; 5 patients are cured clinically; 9 patients are shown as significant efficiency and 7 patients as inefficiency, while the total efficiency is 78.13%;VAS score of the observation group is improved to ( $3.77 \pm 1.69$ ) from ( $6.50 \pm 2.15$ ) evaluated before the treatment; 9 patients are cured clinically; 11 patients are shown as significant efficiency and 3 patients as inefficiency, while the total efficiency is 90.63%. By comparing the curative effect in the groups and between groups before and after treatment, VAS scores of two groups of patients are improved significantly,  $P < 0.05$ , meanwhile, the improvement effect of the observation group is better, regardless of VAS score after treatment or total efficiency in clinic.

### 3.2 By Comparing the Clinical Efficacy of the Patients in the Control Group, the Clinical Cure Rate of Lumbar Disc Herniation Patients is Significantly Lower than that of Lumbar Muscle Strain Patients.

It can be known from Table 4 that after a simple Taijiquan exercise therapy is provided for the control group for 3 months, only a patient is cured among 15 lumbar disc herniation patients, 3 patients are shown as significant efficiency and 6 patients as efficiency, while the cure rate and total efficiency is 6.67% and 66.67%; 4 patients among 17 lumbar muscle strain patients are shown as cure; 6 patients are shown as significant efficiency and 5 patients as efficiency, while the cure rate and total efficiency is 23.53% and 88.24%. It can be seen that the cure rate and total efficiency of lumbar disc herniation patients is not high after 3 months' Taijiquan exercise and its curative effect is obviously lower than that of lumbar muscle strain patients.

### 3.3 By Comparing the Clinical Efficacy of the Patients in the Observation Group, the Clinical Cure Rate of Lumbar Disc Herniation Patients is Significantly Lower than that of Lumbar Muscle Strain Patients but Better Than that of the Control Group.

It can be known from Table 4 that after the observation group is treated for 3 months, 3 patients are cured among 15 lumbar disc herniation patients, 5 patients are shown as significant efficiency and 4 patients as efficiency, while the cure rate and total efficiency is 20.00% and 80.00%; 6 patients among 17 lumbar muscle strain patients are shown as cure; 6 patients are shown as significant efficiency and 5 patients as efficiency, while the cure rate and total efficiency is 35.29% and 100%. It can be seen that the cure rate and

total efficiency of lumbar disc herniation patients is still lower than those of lumbar muscle strain patients, but the cure rate and total efficiency of lumbar disc herniation patients are significantly better than those of the patients with same disease cause in the control group.

Table 2 Comparison of VAS for Two Groups of Patients before and after Treatment( $\bar{x} \pm s$ )

Groups	Male/female (persons)	Before treatment (Scores)	After 3 months' treatment (Scores)
Control group	17/15	6.49±2.11	4.85±1.87 <sup>a</sup>
Observation group	18/14	6.50±2.15	3.77±1.69 <sup>ab</sup>

Note: by comparing it with that before treatment, <sup>a</sup>P<0.05; by comparing the improvement effect of two groups after treatment, <sup>b</sup>P<0.05.

Table 3 Comparison of Curative Effect for Two Groups of Patients after Treatment( $\bar{x} \pm s$ )

Groups	Male/female (persons)	Cure (persons,%)	Significant efficiency (persons,%)	efficiency (persons,%)	Inefficiency (persons,%)	Total efficiency (persons,%)
Control group	17/15	5, 15.63	9, 28.13	11, 34.38	7, 21.87	25, 78.13
Observation group	18/14	9, 28.13 <sup>a</sup>	11, 34.38 <sup>a</sup>	9, 28.13	3, 9.37 <sup>a</sup>	29, 90.63 <sup>a</sup>

Note: by comparing the clinical curative effect of two groups after treatment, <sup>b</sup>P<0.05.

Table 4 Comparison of Curative Effect for Two Groups of Patients from Different Etiologies after Treatment ( $\bar{x} \pm s$ )

Groups	Pain etiology (persons)	Cure (persons,%)	Significant efficiency (persons,%)	efficiency (persons,%)	Inefficiency (persons,%)	Total efficiency (persons,%)
Control group	LD,15	1, 6.67	3, 18.18	6, 40.00	5, 33.33	10, 66.67
	MS,17	4, 23.53 <sup>a</sup>	6, 35.71 <sup>a</sup>	5, 29.41	2, 11.76 <sup>a</sup>	15, 88.24 <sup>a</sup>
Observation group	LD,15	3, 20.00 <sup>b</sup>	5, 36.36 <sup>b</sup>	4, 26.67	3, 20.00 <sup>b</sup>	12, 80.00 <sup>b</sup>
	MS,17	6, 35.29 <sup>ab</sup>	6, 35.71	5, 29.41	0, 0.00 <sup>ab</sup>	17, 100.00 <sup>ab</sup>

Note: "LD" represents lumbar disc herniation and "MS" represents lumbar muscle strain; comparing the clinic efficiency of MS and LD within the groups, <sup>a</sup>P<0.05. Comparing the curative effect of the patients in two groups due to the same disease cause, <sup>b</sup>P<0.05.

#### 4. Discussion

There are many factors resulting in the chronic low back pain of the middle-aged and elderly persons, among which chronic lumbar muscle strain and lumbar disc herniation are the main risk factors of the low back pain. The diseases are induced because the lumbar back muscles or lumbar is damaged for a long term or fatigue is accumulated, especially significant physical function decline among middle-aged and elderly persons. Degenerative disease in lumbar and back function is the main cause of the chronic low back pain of the middle-aged and elderly persons [5,6]. As everyone knows, the waist is a central backbone promoting the human motion and exercising force, while the waist and back muscle groups and spinal skeletal muscle groups are not only the suppliers of the force but also the power sources to support and protect the spine. In the event of the decline in the function of the waist and back muscle groups, especially the decrease of the muscle strength, it will undoubtedly accelerate the fatigue and the back is damaged. To a certain extent, the decline in the muscle strength will also speed up the damage rate of the lumbar. No matter chronic lumbar muscle strain patients or the lumbar disc herniation patients, the patients often reduce or ignore the exercise of the waist and back functions due to their pain and thus their diseases will be more severe when the strength of the waist back muscle groups further declines. Therefore, it is reported that [7,8] low back pain

is closely related to muscular strength and the low back pain patients are often accompanied by abdominal and back muscle dysfunction, which may result in decreasing the stability of lumbar spine. Once the lumbar joint loses stability, it will increase pain symptoms of low back pain patients, especially lumbar disc herniation patients. Therefore, if the middle-aged and elderly people can do some lumbar function exercises appropriately, it may enhance their muscle strength and it is necessary for stabilizing the spine and relieving back pain.

In this study, 32 patients with chronic low back pain are included in the control group, in which they do Taijiquan exercise as a means of the function rehabilitation training. It is reported in many studies that [9,10] Taijiquan exercise relies on motion of the legs and force of the waist and the people's spirit, essence and energy can be improved but also the motion function of lower limbs and the body waist and back strength can be enhanced through Taijiquan exercise, especially improving stability of the body. It can be said that it shows obvious curative effect on chronic low back pain patients. Therefore, Chen Tai Chi eighteen essential actions are selected for practicing in the study. These eighteen essential actions choose Chen Tai Chi martial arts, fitness and health essences. In practicing, the fast and slow actions are combined and the force from legs and waist passes throughout the whole body. It is easy for the elderly people and beginners to master and practice. After 3 months' exercise and treatment, VAS score of the control group is improved significantly in comparison with that before treatment,  $P < 0.05$ , and the total clinical efficiency is 78.13%. It can be seen from two etiology patients, the lumbar disc herniation and lumbar muscle strain, that the cure rate and the total efficiency of the lumbar disc herniation patients are not high, on the contrary, the curative effect of lumbar muscle strain patients is obvious and their cure rate and total efficiency are significantly better than the lumbar disc herniation patients. It can be demonstrated that Taichi exercise can really improve the symptoms of patients with chronic low back pain and have a certain effect, but it shows poor effect on the lumbar disc herniation patients, which may be related to the short term of Taijiquan exercise.

In addition, 32 patients with chronic low back pain are included in the observation group in this study and they receive the therapy combining Taijiquan exercise with the infrared diathermy. Infrared diathermy is a modern physical therapy method that acts the infrared thermal radiation effect on the affected areas of the patients. When the light wave acts on the human body, the muscle tissue temperature increases and thus it can promote telangiectasia, increase local metabolism, eliminate inflammatory substances, promote tissue regeneration and recovery [11,12]; Moreover, the thermal effect can be beneficial to eliminate fatigue, avoid fatigue accumulation after exercise and improve the functional training effect, but also it shows analgesic effect on the joint and local nerve pain [13,14]. After the patients in the observation group are treated by the combined therapy for 3 months, VAS score is improved significantly in comparison with that before treatment and that in the control group,  $P < 0.05$ . The total efficiency of the clinical inter-group is significantly higher than that in control group,  $P < 0.05$ . It can be seen from clinical efficacy of the lumbar disc herniation and lumbar muscle strain in the observation group that the cure rate and the total efficiency of the lumbar disc herniation patients are worse than those of the lumbar muscle strain patients after 3 months' treatment, but the cure rate and the total efficiency of lumbar disc herniation patients is obviously improved in comparison with the patients with same disease cause in the control group. It can be demonstrated that if such therapy is supported by 3 months' infrared diathermy, regardless of the lumbar disc herniation or lumbar muscle strain patients, its curative effect is better than single Taijiquan exercise group.

In summary, it is believed in this study that it can significantly improve the condition of the patients with chronic low back pain after 3 months' short-term Taijiquan exercise therapy, but the curative effect of the lumbar disc herniation patient is worse than that of the lumbar muscle strain patient. As a functional rehabilitation training method, short-term effect of Taijiquan exercise on low back pain caused by lumbar disc herniation, is not ideal. However, the therapy, combining the infrared diathermy, can further alleviate the pain of patients and improve their lumbar function and also significantly improve the curative effect of single Taijiquan exercise.

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