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Effect Evaluation of Physical Therapy Combined with Rehabilitation Training in the Treatment of Lumbar Disc Herniation

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Abstract: *Objective*: To evaluate the intervention effect of physical therapy combined with rehabilitation training on lumbar disc herniation (LDH). *Methods*: A total of 74 LDH patients admitted from August 2023 to August 2025 were selected and equally divided using a random number table. The combined group received physical therapy combined with rehabilitation training, while the reference group received rehabilitation training alone. The differences in total effective rate and pain scores between the two groups were compared. *Results*: The combined group exhibited a higher total effective rate, reduced pain scores after 4 weeks of treatment, increased functional recovery scores, expanded lumbar spine mobility, and improved quality of life scores compared to the reference group ($p < 0.05$). *Conclusion*: Physical therapy combined with rehabilitation training can enhance the total effective rate in LDH patients, alleviate pain symptoms, restore lumbar spine function and joint mobility, and improve patients' quality of life.

Keywords: Physical therapy; Rehabilitation training; Lumbar disc herniation; Pain score; Lumbar spine mobility

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1. Introduction

The etiology of LDH includes lumbar mechanical injury, excessive strain, or degenerative changes in the intervertebral disc, with the pathological basis being damage to the fibrous ring structure. Patients may experience symptoms such as low back and leg pain due to nucleus pulposus herniation, which can significantly affect their quality of life over the long term [1]. Currently, surgery and conservative therapy are the preferred treatment modalities for this condition. However, surgery involves significant trauma and is prone to postoperative complications; therefore, most patients opt for conservative treatment. Rehabilitation training offers a non-invasive advantage, improving lumbar spine stability and enhancing muscle strength, thereby alleviating disease symptoms [2]. Combining physical therapy can further improve lumbar spine mobility using various treatment techniques, demonstrating a significant synergistic effect and higher treatment feasibility. Based on this, this study selected 74 LDH patients to evaluate the therapeutic effect of

physical therapy combined with rehabilitation training.

2. Materials and methods

2.1. General information

A total of 74 LDH patients admitted from August 2023 to August 2025 were selected and equally divided using a random number table. The combined group included 37 patients (21 males and 16 females), aged between 25 and 70 years (mean age: 48.95 ± 4.17 years), with a disease duration ranging from 5 months to 6 years (mean duration: 3.28 ± 0.75 years). The disease was located at L4-5 in 18 patients and at L5-S1 in 19 patients. The reference group included 37 patients (20 males and 17 females), aged between 26 and 72 years (mean age: 48.81 ± 4.22 years), with a disease duration ranging from 6 months to 7 years (mean duration: 3.34 ± 0.52 years). The disease was located at L4-5 in 21 patients and at L5-S1 in 16 patients. No significant differences were observed between the groups ($p > 0.05$).

2.1.1. Inclusion criteria

Diagnosed with LDH through imaging examinations such as CT; presenting with symptoms such as low back pain and muscle weakness; aged under 75 years; disease duration exceeding 3 months; normal communication ability; highly informed about the study.

2.1.2. Exclusion criteria

Suffering from lumbar fractures or severe osteoporosis; having a history of lumbar spine surgery; presenting with contraindications such as skin infections; having cardiovascular or cerebrovascular diseases; participating in other studies or withdrawing midway.

2.2. Methods

The reference group underwent rehabilitation training:

(1) Rubbing the waist

The doctor washed their hands and placed them on the patient's psoas major muscle, rubbing from top to bottom for approximately 15 times until the waist felt warm.

(2) Flying swallow exercise

The patient was instructed to lie prone and alternately lift their upper and lower limbs while forcefully extending their head and upper body to assume a flying swallow posture. Each session included 10 repetitions, performed once or twice daily.

(3) Backward walking training

The patient was asked to walk backward on an open and flat surface for 30 minutes each session, once daily.

(4) Exercise therapy

Trunk muscle stretching exercises were performed.

The patient was instructed to lie supine, arch their chest, and lift their chest and shoulders while inhaling deeply, then return to the starting position and exhale slowly. The patient was then asked to lie supine, flex their lower limbs, and lift their hips as high as possible while arching their chest and waist and inhaling deeply, then return to the starting position and exhale slowly. While lying prone, the patient was instructed to

extend their lower limbs and alternately lift them to the maximum amplitude. While lying prone, the patient lifted their upper body, allowing their upper limbs to naturally flex forward. Each of these exercises was performed 10 times daily.

The combined group received physical therapy in addition to rehabilitation training:

(1) Medium-frequency stimulation

A medium-frequency electrotherapy device was used, with electrode patches placed on the Weizhong, Kunlun, Huantiao, or Jiaji acupoint. The carrier frequency was set to 4 kHz, the modulation amplitude to 75%, the current intensity to 15–25 mA, and the modulation frequency to 100 Hz. Each treatment session lasted 20 minutes, performed once daily, five times a week.

(2) Acupuncture

Acupoint selection included Shenshu, Taixi, Yaoyan, Ashi, Yanglingquan, Weizhong, and Jiaji. The patient was assisted into a lateral recumbent position, and the acupoints were disinfected before acupuncture treatment. A uniform reinforcing-reducing method was used, with the needle depth determined based on the patient's individual condition (50–70 mm). After achieving deqi, the needle handle was manipulated using lifting-thrusting and twirling techniques for 1 minute, and the needle was retained for 30 minutes. While the needle was retained, a moxa stick was placed on the needle handle, 2–3 cm from the skin, and ignited for moxibustion treatment. Moxibustion was performed once daily, preferably five times a week.

(3) Cupping

Xuanbi lotion was heated for 5 minutes to reach a temperature of 45°C. Ten milliliters of the lotion was poured into a glass jar, and cupping was performed using the flashing fire method on the Ashi, Yaotongdian, and Jiaji acupoint. The cups were left in place for 10 minutes, and cupping was performed every 3 days.

The treatment duration for both rehabilitation training and physical therapy was 4 weeks.

2.3. Observation indicators

(1) Pain score

The Visual Analog Scale (VAS) was used, with scores ranging from 0 to 10 and higher scores indicating greater pain intensity.

(2) Functional recovery score

The Japanese Orthopedic Association (JOA) score was used, which includes subjective symptoms (9 points), clinical signs (6 points), and limitations in daily life (14 points), with a maximum score of 29 points. Higher scores indicate better functional recovery.

(3) Lumbar spine mobility

A goniometer was used to measure the rotation, lateral flexion, extension, and flexion mobility of the lumbar spine.

(4) Quality of life score

The Generic Quality of Life Inventory-74 (GQOL-74) was used, which includes physical function, psychological function, material life, and social function, with each item scored out of 100 points. Higher scores indicate better quality of life.

2.4. Efficacy evaluation criteria

Significant efficacy was defined as symptom resolution and straight leg raise of more than 70°; preliminary efficacy was defined as symptom alleviation and straight leg raise of 50–70°; no efficacy was defined as no change in symptoms and straight leg raise of less than 50°.

2.5. Statistical analysis

Data were processed using SPSS 28.0 software. Continuous variables were compared using *t*-tests, and categorical variables were compared using chi-square tests. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Comparison of total effective rate between the two groups

The total effective rate in the combined group was significantly higher than that in the reference group ($p < 0.05$). See **Table 1**.

Table 1. Comparison of total effective rate between the two groups [n/%]

Group	Number of cases	Significant efficacy	Initial efficacy	No efficacy	Total effective rate
Combination group	37	21	15	1	97.30% (36/37)
Reference group	37	16	14	7	81.08% (30/37)
χ^2	-	-	-	-	5.046
p	-	-	-	-	0.025

3.2. Comparison of pain scores between the two groups

After 4 weeks of treatment, the pain score in the combined group was significantly lower than that in the reference group ($p < 0.05$). See **Table 2**.

Table 2. Comparison of pain scores between the two groups [$\overline{x} \pm$ s, points]

Group	Number of cases	Before treatment	After treatment
Combination group	37	5.35 ± 1.49	3.01 ± 0.76
Reference group	37	5.39 ± 1.52	3.86 ± 0.94
t	-	0.114	4.277
p	-	0.909	0.000

3.3. Comparison of functional recovery scores between the two groups

After 4 weeks of treatment, the functional recovery score in the combined group was significantly higher than that in the reference group ($p < 0.05$). See **Table 3**.

Table 3. Comparison of functional recovery scores between the two groups [$\overline{x} \pm s$, points]

Group	Number of cases	Subjective symptoms		Clinical signs		Limitation of daily living	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Combined group	37	4.12 ± 1.35	6.05 ± 0.44	2.51 ± 1.04	4.09 ± 1.15	6.18 ± 1.46	11.86 ± 2.31
Reference group	37	4.10 ± 1.27	5.81 ± 0.56	2.53 ± 1.07	3.54 ± 1.10	6.21 ± 1.49	9.47 ± 2.24
t	-	0.066	2.050	0.082	2.102	0.087	4.518
p	-	0.948	0.044	0.935	0.039	0.931	0.000

3.4. Comparison of lumbar range of motion between the two groups

After 4 weeks of treatment, the lumbar range of motion in the combined group was significantly greater than that in the reference group ($p < 0.05$). See **Table 4**.

Table 4. Comparison of lumbar range of motion between the two groups [$\overline{x} \pm s$, °]

Group	Number of cases	Rotation		Lateral Flexion		Extension		Flexion	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Combined group	37	22.34 ± 3.15	34.18 ± 4.02	20.11 ± 2.74	30.49 ± 3.62	18.39 ± 2.71	29.66 ± 3.18	45.09 ± 5.33	77.16 ± 6.42
Reference group	37	22.39 ± 3.18	29.75 ± 3.97	20.16 ± 2.78	26.84 ± 3.52	18.41 ± 2.65	25.27 ± 3.12	45.13 ± 5.36	72.11 ± 6.35
t	-	0.068	4.769	0.078	4.397	0.032	5.994	0.032	3.402
p	-	0.946	< 0.001	0.938	< 0.001	0.974	< 0.001	0.974	0.001

3.5. Comparison of quality of life scores between the two groups

After 4 weeks of treatment, the quality of life score in the combined group was higher than that in the reference group ($p < 0.05$). See **Table 5**.

Table 5. Comparison of quality of life scores between the two groups [$\overline{x} \pm s$, points]

Group	Number of cases	Physical function		Psychological function		Material life		Social function	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Combined group	37	73.72 ± 6.83	88.94 ± 7.26	72.46 ± 7.14	86.38 ± 7.03	75.18 ± 6.47	89.26 ± 7.58	74.39 ± 6.92	87.53 ± 7.84
Reference group	37	73.68 ± 6.91	82.37 ± 7.53	72.51 ± 7.08	82.84 ± 7.92	75.21 ± 6.52	84.46 ± 7.63	74.42 ± 6.87	83.91 ± 7.69
t	-	0.025	3.821	0.030	2.033	0.020	2.715	0.019	2.005
p	-	0.980	< 0.001	0.976	0.046	0.984	0.008	0.985	0.049

4. Discussion

Lumbar disc herniation (LDH) is an orthopedic disease caused by pathological factors such as rupture of the annulus fibrosus and disc degeneration. The cauda equina and nerve roots are continuously compressed,

leading to symptoms such as lower limb dysfunction and lumbocrural pain [3]. Its main predisposing factors include prolonged sitting or standing, poor dietary habits, and environmental changes, which can severely reduce patients' self-care abilities. Surgery is the primary treatment for this disease, effectively correcting nucleus pulposus herniation, relieving compression on the cauda equina or nerve roots, and thereby improving disease symptoms. However, surgery is traumatic, involves high treatment costs, and is prone to various postoperative complications, which can affect treatment efficacy [4]. In comparison, conservative therapy offers greater convenience, allowing for the reasonable selection of treatment modalities based on the patient's disease characteristics to achieve better therapeutic outcomes.

Rehabilitation training is a fundamental treatment method for LDH patients. It utilizes long-term and scientific training programs to improve blood circulation in the lumbar region, promote rapid absorption of inflammatory responses, and thereby repair damaged lumbar tissues while enhancing the strength of the lumbar and back muscle groups. Combined with physiotherapy, it can regulate lymphatic circulation, relieve muscle spasms, reduce tissue edema severity, and induce continuous endorphin secretion, thereby improving pain symptoms. Physiotherapy encompasses multiple measures with multi-target mechanisms, capable of addressing the etiology and pathogenesis of LDH to enhance treatment efficacy and promote disease recovery [5].

The results showed that the overall response rate in the combined treatment group was higher than that in the reference group. After four weeks of treatment, the pain score in the combined group was lower than that in the reference group, while the functional recovery score, lumbar range of motion, and quality of life score were higher in the combined group ($p < 0.05$). The analysis suggests that rehabilitation training can standardize training of the core muscle groups in the lumbar and back regions, thereby improving muscle strength, activating the neuro-muscular system function, and restoring lumbar stability. Various training exercises can stimulate body receptors, inhibit the release of inflammatory factors, and thereby reduce the degree of inflammatory response and alleviate pain [6]. Techniques such as the flying swallow exercise and backward walking training can restore the physiological function of the intervertebral discs, enhance their dynamic stability, and thereby improve lumbar function and increase range of motion. However, rehabilitation training has a relatively slow onset and primarily focuses on functional training, making it difficult to comprehensively regulate the patient's physiological state, resulting in suboptimal long-term efficacy. Physiotherapy includes modalities such as intermediate-frequency stimulation and acupuncture, which have different mechanisms of action and exhibit synergistic effects. Among them, computerized intermediate-frequency stimulation can activate the opioid peptide system and regulate microcirculation in the lumbar region using the gate control theory, rapidly clearing inflammatory factors around the lesion and thereby alleviating pain symptoms. It also has regulatory mechanisms on systemic blood circulation and nerve conduction processes, promoting blood circulation and accelerating metabolism [7]. Acupuncture includes needle acupuncture and moxibustion therapies. Needle acupuncture can promote blood circulation and remove blood stasis while strengthening the waist and kidneys. In specific acupoint selection, acupuncturing the Shenshu acupoint can replenish Qi and strengthen yang while nourishing the kidneys and yin; acupuncturing the Taixi acupoint can nourish the kidneys and regulate menstruation while reducing fire and nourishing yin; acupuncturing the Ashi, Yanglingquan, and Weizhong acupoint can promote blood circulation and remove blood stasis while continuously relieving pain, dispelling wind pathogens, and promoting blood circulation and flexibility; acupuncturing the Jiaji acupoint can relax muscles and improve blood circulation in the lumbar region [8]. Moxibustion generates thermal effects, providing warm stimulation

to acupoints, thereby improving meridian conduction function and relieving pathological manifestations such as nerve root edema. Additionally, acupuncture can accelerate lymphatic return, improve symptoms such as joint stiffness and limited range of motion, and thereby increase lumbar range of motion. The combination of needle acupuncture and moxibustion produces immediate therapeutic effects, rapidly relieving lumbocrural pain symptoms and effectively restoring lumbar function. Cupping therapy stimulates both meridians and acupoints, having effects such as removing dampness and dispersing cold, dredging meridians, and relieving pain and swelling. It can relax the muscles in the lumbar and back regions, improve local metabolic status, and transport nutrients to the lumbar region, thereby repairing tissues [9]. The local effects of cupping therapy can reduce inflammatory exudation, improve tissue edema, and thereby clear aseptic inflammation, reducing pain scores while improving joint function. The Xuanbi lotion used in cupping therapy contains herbs such as Lycopodiaceae, Clematis, and Atractylodes, which can exert analgesic effects by dispersing cold through thermal effects and meridian stimulation [10]. After combined treatment, patients' clinical symptoms are significantly relieved, reducing the multiple impacts of LDH on their quality of life and enabling them to return to normal life. Additionally, combined treatment can prevent disease recurrence, maintain long-term stability of lumbar function, reduce patients' psychological burden, improve their physical and mental comfort, and significantly enhance their quality of life.

5. Conclusion

In conclusion, physiotherapy combined with rehabilitation training can improve the overall treatment efficacy for LDH patients, alleviate lumbocrural pain symptoms, improve lumbar function and range of motion, and facilitate effective enhancement of patients' quality of life, serving as a common treatment modality for patients with this disease.

Disclosure statement

The author declares no conflict of interest.

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