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Original Paper

The Effect of Massage Combined with Non-surgical Spinal Decompression System Traction on the Pain Level and Motor Function of Patients with Lumbar Disc Herniation

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Abstract

Objective: To investigate the effects of massage combined with non-surgical spinal decompression system traction on the pain level and motor function of patients with lumbar disc herniation (Lumbar Disc Herniation, LDH). Methods: From June 2023 to June 2024, 120 patients with LDH who were admitted to the massage department of Taihe Hospital in Shiyan City were selected. All patients originated from the orthopedic rehabilitation ward. All patients were randomly divided into the control group and the combined group, with 60 cases in each group. The control group received conventional massage treatment, while the combined group received non-surgical spinal decompression system (Non-surgical Spinal Decompression System, NSSDS) traction in addition to massage. The changes in visual analogue scale (VAS), Oswestry Disability Index (ODI), straight leg raising angle (SLR), and lumbar range of motion (ROM) before and after treatment were compared between the two groups, and the total effective rate was calculated. Data were analyzed using SPSS 26.0 statistical software. Intra-group comparisons were performed using paired t-tests, and inter-group comparisons were performed using independent sample t-tests. Count data were analyzed using the χ^2 test. A P value < 0.05 was considered statistically significant. Results: After treatment, both groups showed significant improvements in VAS, ODI, SLR, and ROM compared to before treatment (P < 0.05), and the improvement in the combined group was significantly greater than that in the control group (P < 0.05). The VAS score of the combined group decreased by (4.78 ± 0.91) points, which was better than that of

the control group (3.68 ± 1.04) points (t = 6.12, P < 0.001); the improvement rate of ODI was significantly higher (t = 5.78, P < 0.001); the SLR angle and ROM were significantly improved (t = 4.96, P < 0.001). The total effective rate of the combined group was 93.3%, which was significantly higher than that of the control group (78.3%) (χ^2 = 4.25, P = 0.039). Conclusion: Massage combined with non-surgical spinal decompression system traction can significantly alleviate the pain of patients with lumbar disc herniation, improve lumbar range of motion and daily functional impairment, has high safety, and has better clinical efficacy than simple massage treatment.

Keywords

Lumbar Disc Herniation, Massage, Non-surgical Spinal Decompression System, Pain, Motor Function

1. Introduction

Lumbar Disc Herniation (LDH) is one of the common diseases causing lower back and leg pain in clinical practice (Farley, T., Stokke, J., Goyal, K., et al., 2024; Hincapié, C. A., Kroismayr, D., Hofstetter, L., et al., 2025). With the changes in social working patterns, the increase in sedentary individuals and the lack of physical activity, the incidence of LDH has been increasing year by year (Knezevic, N. N., Candido, K. D., Vlaeyen, J. W. S., et al., 2021). According to epidemiological statistics, approximately 15% to 20% of adults in China suffer from varying degrees of intervertebral disc degeneration or protrusion, with the 30-50 age group being the high-risk group (Ren, G., Liu, L., Zhang, P., et al., 2024). The main pathological mechanism of LDH is the degeneration and rupture of the intervertebral disc's fibrous ring, the protrusion or displacement of the nucleus pulposus, and the compression of nerve roots or the cauda equina, resulting in lower back pain, radiating pain in the lower limbs, numbness, and limited mobility (Wang, Z., Liu, X., Gao, K., et al., 2024).

In the treatment of LDH, conservative treatment remains the preferred option. Massage is one of the traditional treatment methods in traditional Chinese medicine, which plays an important role in reducing pain and restoring function by relaxing soft tissues, adjusting joint balance, improving blood circulation and nerve conduction through manual techniques (Guan, J., Liu, T., Yu, X., et al., 2023). The non-surgical spinal decompression system (NSSDS) is a modern rehabilitation device that precisely reduces intervertebral disc pressure through computer-controlled traction force and angle, promoting the retraction of the nucleus pulposus and improving the environment for nerve root compression, thereby achieving pain relief and functional improvement (Adar, S., Apaydın, O., Dündar, U., et al., 2024; Amjad, F., Mohseni-Bandpei, M. A., Gilani, S. A., et al., 2022; El Melhat, A. M., Youssef, A. S. A., Zebdawi, M. R., et al., 2024).

Massage and the non-surgical spinal decompression system each have their own advantages, and combining the two can form a complementary effect (Dal, C., Koç, M., Bayar, B., 2024; Draper-Rodi, J., Newell, D., Barbe, M. F., et al., 2024). Massage can improve local soft tissue tension, creating favorable conditions for traction treatment (Er, G., & Yüksel, İ., 2023). traction can further consolidate the effects of massage, promote the repositioning of the intervertebral disc and nerve decompression,

forming a comprehensive treatment model of "relaxation - decompression - stabilization" (Ma, Q., Zhou, X., Liang, H., et al., 2024). Therefore, this study takes the cases of the Massage Department of Taihe Hospital in Shiyan City as the basis to explore the impact of massage combined with non-surgical spinal decompression system traction on the pain and functional impairment of LDH patients.

2. Method

2.1 General Information

A total of 120 patients with LDH who were treated in the Tui Na Department of Taihe Hospital in Shiyan City from June 2023 to June 2024 were included. They were randomly divided into the control group and the combined group, with 60 cases in each group. There were no statistically significant differences in gender, age, and disease duration between the two groups ($P > 0.05$). This study has been approved by the ethics committee (Ethical Review Number: 2025KS257). All patients signed the informed consent form before the trial, and the conduct of this study followed the principles of the Helsinki Declaration. Inclusion criteria: ① Conform to the LDH diagnostic criteria of the "Chinese Traditional Medicine Disease and Syndrome Diagnosis and Therapeutic Effect Standards"; ② Diagnosed as single-segment intervertebral disc protrusion by imaging (MRI/CT); ③ Age 18-65 years; ④ Signed the informed consent form. Exclusion criteria: ① Complicated with severe cardiovascular or bone osteoporosis diseases; ② Previous history of spinal surgery; ③ Pregnant or patients with mental disorders.

2.2 Treatment Methods

The control group received conventional Tui Na treatment, 30 minutes each time, 5 times a week, for a total of 4 weeks. The main techniques included rolling, pressing, twisting, and lifting, mainly to relax the lumbar and sacrospinous muscle groups. The combined group received additional NSSDS traction treatment on the basis of Tui Na, with the traction angle determined according to the affected segment, the traction force set at 40% - 50% of body weight, 20 minutes each time, 5 times a week, for a total of 4 weeks. During the treatment, the patient's reaction was monitored to avoid excessive traction.

2.3 Observation Indicators

Before and after treatment, the following were evaluated: ① Pain degree (VAS score); ② Functional impairment (Oswestry Functional Disability Index, ODI); ③ Degree of nerve root compression (Straight Leg Raising Angle, SLR); ④ Lumbar range of motion (ROM). The therapeutic effect was classified into three categories: marked improvement - significant improvement in pain and function, normal activity; effective - symptom reduction, partial recovery of activity; ineffective - no significant change in symptoms. The total effective rate = (marked improvement + effective) / total number of cases × 100%.

2.4 Statistical Analysis

Analysis was performed using SPSS 26.0 software. Measurement data were expressed as $\bar{x} \pm s$,

within-group comparison was conducted using paired t-test, and between-group comparison was conducted using independent sample t-test; count data were tested using χ^2 test. The significance level $\alpha = 0.05$, and differences were considered statistically significant if $P < 0.05$.

3. Result

3.1 Comparison of Visual Analogue Scale (VAS) Scores Before and After Treatment

The VAS scores of both groups decreased significantly after treatment ($P < 0.001$), indicating that the pain was significantly relieved. The decrease in the combined group was greater than that in the control group, and the difference between the groups was statistically significant ($t = 4.58$, $P < 0.001$). This suggests that the combined treatment has a stronger synergistic effect in alleviating pain caused by nerve root compression. Relaxing the soft tissues through massage and then performing mechanical decompression can more effectively improve nerve conduction and blood circulation, thereby achieving a better analgesic effect (Table 1).

Table 1. Comparison of VAS Scores Before and After Treatment

group	Pre-treatment VAS	Post-treatment VAS	t-value	P-value
control group	6.82±1.07	3.14±0.96	5.74	<0.001
combined group	6.79±1.02	2.01±0.88	6.12	<0.001
t-value	/	4.58		
P-value	/	<0.001		

Note. VAS: Visual Analogue Scale. Data are expressed as mean ± standard deviation. Intragroup comparisons were performed using paired t-tests; intergroup comparisons were performed using independent sample t-tests.

3.2 Changes in Oswestry Disability Index (ODI) Scores Before and After Treatment

After treatment, the ODI scores of both groups significantly decreased, and the decrease in the combined group was more pronounced compared to the control group ($t = 3.92$, $P < 0.001$). This indicates that the combined therapy can more effectively improve lumbar functional disorders and enhance the ability to perform daily activities. The release and neuroregulatory effects of massage, combined with the mechanical reset and decompression effects brought about by NSSDS traction, jointly promoted the restoration of lumbar mechanical balance (Table 2).

Table 2. Changes in ODI Scores

group	Pre-treatment ODI	Post-treatment ODI	t-value	P-value
control group	52.6±8.4	31.8±7.5	5.12	<0.001
combined group	51.9±8.6	24.2±6.8	5.78	<0.001
t-value	/	3.92		
P-value	/	<0.001		

Note. ODI: Oswestry Disability Index. Data are expressed as mean ± standard deviation. A lower ODI score indicates less functional impairment. $P < 0.05$ was considered statistically significant.

3.3 Comparison of Straight Leg Raising (SLR) Angles and Lumbar Range of Motion (ROM) Before and After Treatment

After the treatment, the SLR angles and ROM of both groups significantly increased ($P < 0.001$), and the improvement in the combined group was greater ($t = 3.84$, $P < 0.001$). This indicates that the combined treatment can more effectively relieve nerve root compression and restore lumbar spine mobility. Massage improved the tension of the paravertebral muscles, providing a relaxed tissue foundation for traction. And NSSDS further expanded the intervertebral space and promoted the retraction of the nucleus pulposus, thereby accelerating functional recovery (Table 3).

Table 3. Changes in SLR Angles and ROM Improvement

group	Pre-treatment SLR (°)	Post-treatment SLR (°)	Pre-treatment ROM (°)	Post-treatment ROM (°)
control group	45.2	65.4	130.6	162.3
combined group	46.1	73.5	131.4	178.5
t-value	/	3.84	/	3.20
P-value	/	<0.001	/	<0.001

Note. SLR: Straight Leg Raising; ROM: Range of Motion. Data are expressed as mean values. Intragroup and intergroup differences were analyzed using t-tests. Higher values indicate greater functional improvement.

3.4 Comparison of Overall Clinical Efficacy Between the Two Groups

The total effective rate of the combined treatment group was 93.3%, significantly higher than that of the control group (78.3%) ($\chi^2 = 4.25$, $P = 0.039$). The combined therapy, by comprehensively exerting the synergistic mechanism of "relaxing muscles - reducing intervertebral pressure - stabilizing mechanics", not only can alleviate symptoms in the short term, but also can improve nerve root function and lumbar spine stability, with more lasting efficacy and lower recurrence rate (Table 4).

Table 4. Comparison of Clinical Efficacy

group	Effective	valid	invalid	total effective rate(%)
control group	24	23	13	78.3
combined group	33	23	4	93.3
t-value	/	/	/	4.25
P-value	/	/	/	0.039

Note. Total effective rate = (markedly effective + effective) / total cases × 100%. Statistical comparisons were conducted using the χ^2 test. $P < 0.05$ indicates a significant difference.

4. Discussion

The results of this study indicate that the combination of massage therapy and non-surgical spinal decompression system traction can significantly alleviate the pain and functional impairment in patients with lumbar disc herniation (Yu, P., Mao, F., Chen, J., et al., 2022). The mechanism involves multiple aspects. Massage therapy stimulates muscle and joint receptors, regulates neural reflexes, improves local blood supply and muscle tension, thereby relieving pain caused by muscle spasms or joint misalignment (Rizzo, R. R., Cashin, A. G., Wand, B. M., et al., 2025). Non-surgical spinal decompression system traction precisely controls the traction parameters, which can reduce intervertebral disc pressure while maintaining the physiological curvature, promote nucleus pulposus retraction, and alleviate nerve root compression (Hathi, K., Bigney, E., Richardson, E., et al., 2023; Özden, F., Tümtürk, İ., Şimşek, M., et al., 2025).

The advantage of combined treatment lies in that massage therapy can relax soft tissues and increase the flexibility between vertebrae, making the force distribution more uniform during traction; traction maintains the mechanical balance of the vertebrae after massage to prevent recurrence (Sadora, J., Vilsmark, E., Bashara, A., et al., 2023; Thornton, J. S., Caneiro, J. P., Hartvigsen, J., et al., 2021). This "relaxation - decompression - stabilization" treatment model can not only quickly relieve symptoms but also fundamentally improve the mechanical state of the lumbar spine and reduce the risk of recurrence. In this study, the improvement amplitudes of VAS, ODI, SLR and ROM in the combined group were significantly better than those in the control group, suggesting that the combined treatment has a synergistic effect in reducing nerve root compression, restoring nerve conduction function and improving motor ability. In addition, no obvious adverse reactions were found during the study period, indicating that this method is safe and has good patient compliance (Yildirim, P., & Gultekin, A., 2022). However, this study still has certain limitations: the sample size is small and the observation period is short, and no long-term efficacy and recurrence rate were tracked and analyzed. In the future, the sample size can be expanded, the follow-up time can be prolonged, and multi-dimensional evaluations can be conducted by combining MRI imaging and inflammatory indicators to further verify the mechanism and long-term effects of massage therapy combined with NSSDS treatment (Schueren, S.,

Luginsland, L. A., Medina, G. A., et al., 2025; Than, C. A., Hajeir, M. Y., Al Darwashi, L. M., et al., 2025).

In conclusion, massage therapy combined with non-surgical spinal decompression system traction can effectively alleviate pain, improve lumbar spine movement and daily functions, and is a non-surgical comprehensive rehabilitation program worthy of promotion. Massage therapy combined with non-surgical spinal decompression system traction can effectively relieve pain, improve functional impairment and increase lumbar spine mobility. This therapy is safe, highly operable, and has significantly better clinical efficacy than simple massage therapy, and has good promotion value and application prospects.

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