Effect of Umbilical Moxibustion Combined with Lumbar Back Muscle Functional Exercise on Pain and Pain Mediators in Patients with Cold-Dampness Obstruction Type Lumbar Disc Herniation

Authors: Wang Yeqing

Date: 2023-11-28T00:00:00+00:00

Abstract

Objective: To investigate the analgesic effect of umbilical moxibustion combined with lumbar and back muscle functional exercise in patients with cold-dampness obstruction type lumbar disc herniation and its influence on pain-inducing factors. Methods: A total of 122 patients with cold-dampness obstruction type lumbar disc herniation admitted to the First Affiliated Hospital of Hunan University of Chinese Medicine from October 2021 to October 2023 were selected and divided into a routine group and an experimental group using the random number table method, with 61 cases in each group. The routine group received lumbar and back muscle functional exercise intervention, while the experimental group received additional umbilical moxibustion intervention on top of the routine group. Pain severity, lumbar function, activities of daily living, pain-inducing factors, and serum inflammatory factor levels were compared between the two groups before and after intervention. Results: After 3, 7, and 15 days of intervention, the Visual Analogue Scale (VAS) scores of both groups decreased compared with before intervention (all P<0.05), and the experimental group was lower than the routine group at the same time points (all P<0.05). After 15 days of intervention, the Oswestry Disability Index (ODI) scores and serum levels of substance P (SP), neuropeptide Y (NPY), 5-hydroxytryptamine (5-HT), prostaglandin E2 (PGE2), bradykinin (BK), cyclooxygenase-2 (COX-2), transforming growth factor-$ 1(*TGF*− 1), *interleukin* − 1 $ (IL-1β), and tumor necrosis factor-α (TNF-α) in both groups decreased compared with before intervention (all P<0.05), and the experimental group was lower than the routine group at the same time point (all P<0.05). The Japanese Orthopaedic Association (JOA) scores and Barthel Index scores of both groups increased compared with before intervention (all P<0.05), and the experimental group was higher

than the routine group at the same time point (all P<0.05). Conclusion: The application of umbilical moxibustion combined with lumbar and back muscle functional exercise in treating patients with cold-dampness obstruction type lumbar disc herniation can significantly improve pain severity, lumbar function, and activities of daily living, and reduce the levels of pain-inducing factors and serum inflammatory factors.

Full Text

The Effect of Umbilical Moxibustion Combined with Lumbar and Back Muscle Functional Exercise on Pain and Pain-Related Factors in Patients with Cold-Dampness Blockage Type Lumbar Disc Herniation

Abstract

Objective: To investigate the effect of umbilical moxibustion combined with lumbar and back muscle functional exercise on pain and pain-related factors in patients with cold-dampness blockage type lumbar disc herniation.

Methods: A total of 122 patients with cold-dampness blockage type lumbar disc herniation admitted to the First Affiliated Hospital of Hunan University of Chinese Medicine between October 2021 and October 2023 were enrolled and randomly divided into a conventional group and an experimental group (n=61 each) using a random number table method. The conventional group received lumbar and back muscle functional exercise intervention, while the experimental group received additional umbilical moxibustion intervention. Pain intensity, lumbar function, daily living activities, pain-related factors, and serum inflammatory factor levels were compared between the two groups before and after intervention.

Results: After 3, 7, and 15 days of intervention, VAS scores in both groups decreased compared with baseline (P<0.05 for all), with significantly lower scores in the experimental group than in the conventional group at each time point (P<0.05 for all). After 15 days of intervention, ODI scores and serum levels of substance P (SP), neuropeptide Y (NPY), 5-hydroxytryptamine (5-HT), prostaglandin E2 (PGE2), bradykinin (BK), cyclooxygenase-2 (COX-2), transforming growth factor-$ 1(TGF-1), interleukin-1 $ (IL-1β), and tumor necrosis factor-α (TNF-α) all decreased compared with baseline (P<0.05 for all), with significantly greater reductions in the experimental group (P<0.05 for all). Japanese Orthopaedic Association (JOA) and Barthel Index (BI) scores increased in both groups compared with baseline (P<0.05 for all), with significantly higher scores in the experimental group (P<0.05 for all).

Conclusion: Umbilical moxibustion combined with lumbar and back muscle functional exercise can significantly improve pain intensity, lumbar function, and daily living activities while reducing pain-related factors and serum inflam-

matory factor levels in patients with cold-dampness blockage type lumbar disc herniation.

Keywords: Umbilical moxibustion; Lumbar and back muscle functional exercise; Lumbar disc herniation; Pain-related factors

---

Lumbar disc herniation is a syndrome caused by lumbar disc degeneration with rupture of the annulus fibrosus and protrusion of the nucleus pulposus, leading to compression of the cauda equina and nerve roots. Its main clinical manifestations include low back pain, cauda equina syndrome, and sciatica, which seriously affect patients' daily lives [1]. Lumbar and back muscle functional exercise has been commonly used clinically to improve spinal stability, protect the lumbar spine, and promote recovery of lumbar function. However, recent clinical studies have reported that exercise intervention alone has limited efficacy and may exacerbate pain during treatment, resulting in poor patient compliance [2]. According to traditional Chinese medicine (TCM) theory [3], lumbar disc herniation results from weakened external defense allowing invasion of wind, cold, and dampness pathogens into the lumbar region, with cold-dampness blockage type being the most common pattern. Umbilical moxibustion is an external TCM therapy that utilizes the thin, highly sensitive skin of the navel with rapid absorption characteristics. By applying pure yang heat from moxibustion, it penetrates the skin and stimulates tissues to harmonize qi and blood, dredge meridians, and prevent or treat disease. This therapy has been widely applied in gastrointestinal disorders, gynecological diseases, and endocrine-related conditions [4]. Therefore, this study investigated the effects of umbilical moxibustion combined with lumbar and back muscle functional exercise on pain and pain-related factors in 122 patients with cold-dampness blockage type lumbar disc herniation admitted to our hospital between October 2021 and October 2023.

1.1 Clinical Data

We enrolled 122 patients with cold-dampness blockage type lumbar disc herniation admitted to the First Affiliated Hospital of Hunan University of Chinese Medicine between October 2021 and October 2023. All patients provided informed consent, and the study was approved by our hospital's ethics committee. Inclusion criteria were: (1) diagnosis confirmed by CT or MRI according to the "Guidelines for the Diagnosis and Treatment of Lumbar Disc Herniation" [5]; (2) meeting TCM criteria for cold-dampness blockage type, manifested as cold and heavy pain in the waist and legs, difficulty turning, pain not relieved or even worsened by rest, aggravated by cold and alleviated by heat, accompanied by limited lower limb activity, plump and pale tongue with white greasy coating; (3) acceptance of the intervention protocol with good compliance. Exclusion criteria were: (1) participation in other hospital studies within one month; (2) history of lumbar fracture; (3) communication disorders; (4) history of lumbar disc surgery. Dropout criteria were: (1) use of other treatments after enroll-

ment; (2) severe adverse reactions requiring termination; (3) discontinuation due to treatment ineffectiveness. The 122 patients were randomly divided into a conventional group and an experimental group (n=61 each) using a random number table method. Baseline clinical characteristics showed no statistically significant differences between the two groups (P>0.05). Details are presented in .

1.2 Interventions

1.2.1 Lumbar and Back Muscle Functional Exercise The conventional group received lumbar and back muscle functional exercise intervention consisting of five components: (1) Supine straight leg raising: patients in supine position raised both legs alternately in a pedaling motion, 50 repetitions per set, 20 sets daily. (2) Swallow exercise: patients in prone position with both lower limbs extended and hands placed beside the body, keeping the lower body stationary while lifting the head and extending the upper back, starting with 3 sets of 10 repetitions daily and gradually progressing to simultaneous extension of the upper body and both lower limbs, forming a swallow-like arch in the lumbar region, 10 sets of 20 repetitions daily. (3) Five-point support exercise: patients in supine position with hands supporting the waist, knees semi-flexed at 90°, feet on the bed, using the head and both elbows to support the upper body and both feet to support the lower body to form a semi-bridge shape, with knees slightly separated when lifting the trunk, starting slowly and gradually increasing speed, 5 sets of 20 repetitions daily, progressing to 20 sets of 50 repetitions. (4) Three-point support exercise: starting position same as five-point support, with upper limbs off the bed and placed on the chest, using the head and both knees as three support points, holding for 5 seconds per repetition, 10 repetitions per set, 20 sets daily. (5) Plank exercise: patients in prone position maintaining a straight body line supported by toes and forearms, contracting abdominal muscles for 10 seconds then relaxing, avoiding breath-holding throughout.

1.2.2 Umbilical Moxibustion The experimental group received additional umbilical moxibustion intervention. The protocol included: (1) Preparing medicinal powder by grinding equal proportions of Qingpi (Citrus reticulata peel), Muxiang (Aucklandia lappa), Yimucao (Leonurus japonicus), Danggui (Angelica sinensis), Chuanxiong (Ligusticum wallichii), Yanhusuo (Corydalis yanhusuo), Baizhi (Angelica dahurica), and Ruxiang (Boswellia carterii); preparing a standard dough bowl and moxa cone. (2) Patients in supine position with relaxed body and steady breathing received abdominal massage with Tai Chi kneading and Bagua tuina techniques. (3) The umbilical area was fully exposed (clothing removed to expose Zhongwan superiorly, Guanyuan inferiorly, and Daheng points laterally), with the navel filled with medicinal powder. (4) A dough bowl was placed over the navel with a central hole slightly larger than the navel for medication delivery, filled to 80% capacity. (5) A protective cloth was placed over the dough bowl, covering Zhongwan and Guanyuan points vertically and extending across both sides of the abdomen

horizontally. (6) The moxa cone was placed in the dough bowl, the smoke exhaust system activated, and the moxa ignited. (7) A physiotherapy lamp was positioned to warm the abdomen. (8) Patient condition was monitored throughout the burning process, with immediate cessation if discomfort occurred. (9) After treatment, the medicinal powder was sealed in the navel with a compress for 4 hours, after which patients cleaned the area and were monitored for allergic reactions. (10) Patients were instructed to avoid eating or drinking for 30 minutes post-treatment, could bathe after 3 hours, and should maintain warmth and dietary restrictions during the treatment period. Treatment commenced at 9:00 AM, lasting 1.5 hours per session, with continuous moxibustion for 3 days followed by 1 day of rest constituting one cycle, for a total of 4 cycles.

1.3 Outcome Measures

1.3.1 Pain Intensity Pain intensity was assessed using the Visual Analogue Scale (VAS) before intervention and at 3, 7, and 15 days post-intervention. The conventional group was evaluated 1 hour after daily exercise, while the experimental group was evaluated 4 hours after moxibustion treatment. Patients were shown a 10-cm horizontal line with 0 representing no pain and 10 representing severe pain, and asked to indicate their pain level corresponding to a number on the scale. Total score ranged from 0-10, with higher scores indicating greater pain severity.

1.3.2 Lumbar Function and Daily Living Activities Lumbar function was evaluated using the Oswestry Disability Index (ODI), which assesses pain intensity, sleep disturbance, sitting, walking, standing, lifting, traveling, sexual life, self-care, and social life, with total scores ranging from 0-50 (higher scores indicating worse function). The Japanese Orthopaedic Association (JOA) scale was used to evaluate lumbar function based on subjective symptoms, clinical signs, bladder function, and daily activity limitations, with total scores ranging from 0-29 (higher scores indicating better function). Daily living activities were assessed using the Barthel Index (BI), which evaluates feeding, bathing, grooming, dressing, urinary and bowel control, walking, toileting, bed-chair transfer, and stair climbing, with total scores ranging from 0-100 (higher scores indicating better independence).

1.3.3 Pain-Related Factors Fasting venous blood samples (5 ml) were collected before intervention and 2 hours after completion of the 15-day intervention, placed in centrifuge tubes containing sodium citrate anticoagulant, and left to stand for 0.5 hours. Serum was separated by centrifugation at 3000 r/min for 10 minutes using a JIDI-20D medical centrifuge (Guangzhou Jidi Instrument Co., Ltd.). Serum levels of substance P (SP), neuropeptide Y (NPY), 5-hydroxytryptamine (5-HT), prostaglandin E2 (PGE2), and bradykinin (BK) were measured by enzyme-linked immunosorbent assay using an LD-96A enzyme-linked analyzer (Shandong Laiende Intelligent Technology

Co., Ltd.). Serum levels of cyclooxygenase-2 (COX-2), transforming growth factor-$ 1($TGF-$ 1), $interleukin-$ 1 $ (IL-1β), and tumor necrosis factor-α (TNF-α) were also measured.

1.4 Statistical Analysis

Data were analyzed using SPSS 22.0 software. Measurement data were expressed as mean ± standard deviation (c ±s) and analyzed using t-tests, while count data were expressed as [n(%)] and analyzed using ^{2} tests. Statistical significance was set at P<0.05.

2.1 Comparison of Pain Intensity

After 3, 7, and 15 days of intervention, VAS scores in both groups decreased compared with baseline (P<0.05 for all), with significantly lower scores in the experimental group than in the conventional group at each time point (P<0.05 for all). Details are presented in .

2.2 Comparison of Lumbar Function and Daily Living Activities

After 15 days of intervention, ODI scores in both groups decreased compared with baseline (P<0.05 for all), with significantly lower scores in the experimental group (P<0.05 for all). JOA and BI scores in both groups increased compared with baseline (P<0.05 for all), with significantly higher scores in the experimental group (P<0.05 for all). Details are presented in .

2.3 Comparison of Pain-Related Factors

After 15 days of intervention, serum levels of SP, NPY, 5-HT, PGE2, and BK in both groups decreased compared with baseline (P<0.05 for all), with significantly greater reductions in the experimental group (P<0.05 for all). Details are presented in .

2.4 Comparison of Serum Inflammatory Factors

After 15 days of intervention, serum levels of COX-2, TGF-$ 1, $IL-$ 1 , $andTNF-$ $ in both groups decreased compared with baseline (P<0.05 for all), with significantly greater reductions in the experimental group (P<0.05 for all). Details are presented in .

Lumbar disc herniation is a common and frequently occurring disease in orthopedics and traumatology, representing a degenerative spinal condition that often causes lumbocrural pain and affects patients' daily lives [6]. Current Western medicine primarily employs surgical or conservative treatments, with surgery reserved for severe cases while most patients receive conservative interventions. Lumbar and back muscle functional exercise is a commonly used conservative approach that effectively maintains lumbar stability, corrects scoliotic deformities, promotes local blood circulation and inflammatory factor absorption, releases

adhesions between nerves and dura mater, and facilitates recovery of lumbar function [7]. However, exercise alone cannot meet the needs of patients and clinicians, and exploration of novel interventions has become a research priority with increasing incidence of lumbar disc herniation [8].

According to TCM theory [9], lumbar disc herniation belongs to the categories of "lumbocrural pain" and "bi syndrome," resulting from damage to lumbar muscles from heavy labor combined with invasion of wind, cold, and dampness pathogens, leading to qi and blood stagnation and malnourishment of the lumbar region, predominantly manifesting as cold-dampness blockage type. The umbilicus has intimate connections with the entire meridian system and viscera, representing the thinnest part of the abdominal wall without subcutaneous fat but rich in blood vessels, making it an ideal route for drug delivery [10]. Umbilical moxibustion involves herbal moxibustion over the navel, which harmonizes qi and blood, dredges meridians, and prevents or treats disease. According to the midnight-noon ebb-flow doctrine, 9-11 AM corresponds to the Spleen Meridian period. Since TCM holds that the spleen governs muscles, moxibustion during this time period better strengthens spleen function, making muscles plump and vigorous.

Our findings demonstrate that after 3, 7, and 15 days of intervention, VAS scores in both groups decreased significantly from baseline ($P<0.05$ for all), with greater reductions in the experimental group ($P<0.05$ for all). After 15 days, ODI scores decreased significantly in both groups ($P<0.05$ for all), with lower scores in the experimental group ($P<0.05$ for all), while JOA and BI scores increased significantly ($P<0.05$ for all), with higher scores in the experimental group ($P<0.05$ for all). These results are consistent with those reported by Wu et al. [11]. Lumbar and back muscle functional exercise enhances core muscle strength and restores lumbar muscle mechanics and stability. The umbilical moxibustion formula includes Qingpi to soothe liver qi, Yimucao to activate blood and regulate menstruation, Baizhi to activate blood and dispel wind-cold while relieving pain, Muxiang to move liver qi and relieve pain while strengthening the spleen, Chuanxiong to activate blood and move qi while dispelling wind and relieving pain, Yanhusuo to activate blood and move qi while relieving pain, Danggui to tonify and activate blood while regulating menstruation, and Ruxiang to activate blood and move qi while opening orifices. These herbs collectively achieve effects of activating blood, resolving stasis, soothing the liver, regulating qi, dispersing masses, warming the meridians, and relieving pain. Additionally, moxibustion heat creates local vapor pressure at the umbilicus, generating strong pressure that breaks through stasis points, restores meridian flow, and drives qi and blood rapidly along the meridians to dispel wind-cold and dredge meridians, effectively relieving pain, improving lumbar function, and enhancing daily living capacity.

Furthermore, SP is involved in pain transmission; NPY accelerates microvascular constriction, increases pain sensation, and promotes 5-HT secretion; increased 5-HT secretion enhances pain sensitivity; PGE2 promotes pain media-

tor secretion; and BK continuously generates pain sensation [12]. Our study showed that after 15 days of intervention, serum levels of SP, NPY, 5-HT, PGE2, and BK decreased significantly in both groups (P<0.05 for all), with greater reductions in the experimental group (P<0.05 for all). This may be attributed to the significant lumbocrural pain and high levels of pain-related factors in these patients. Umbilical moxibustion utilizes moxibustion heat to promote drug absorption, effectively activating blood, dredging meridians, moving qi, and relieving pain, thereby inhibiting pain mediator secretion, alleviating pain intensity, and reducing pain-related factor levels.

Additionally, COX-2 participates in various arthritic inflammatory responses; TGF-$ 1 $ is a fibrogenic factor that aggravates inflammatory reactions; $ IL-1 $ is an inflammatory promoter that accelerates inflammatory processes; and TNF-α is a common inflammatory factor. Our study demonstrated that after 15 days of intervention, serum levels of COX-2, TGF-$ 1, $ IL-1 $, and $ TNF- $ decreased significantly in both groups (P<0.05 for all), with greater reductions in the experimental group (P<0.05 for all). This may be because lumbar disc herniation compresses the cauda equina and nerve roots, causing tissue adhesions and inflammatory reactions. Umbilical moxibustion utilizes moxibustion heat and absorbed herbs to effectively dredge meridians, activate blood, and resolve stasis, thereby repairing damaged tissues, alleviating inflammatory reactions, and reducing serum inflammatory factor levels.

In conclusion, umbilical moxibustion combined with lumbar and back muscle functional exercise can significantly improve pain intensity, lumbar function, and daily living activities while reducing pain-related factors and serum inflammatory factor levels in patients with cold-dampness blockage type lumbar disc herniation.

References

[1] Li F, Ren YJ, Wan C, et al. Clinical observation of fire needle combined with governor vessel moxibustion in treating cold-dampness blockage type lumbar disc herniation [J]. Journal of Guangzhou University of Traditional Chinese Medicine, 2022, 39(8):1814-1818.

[2] Lu CA, Xiao HJ, Xue F. Observation on the efficacy of PLDD combined with lumbar and back muscle functional exercise in treating lumbar disc herniation and its effect on IL-6 and TNF-α levels [J]. Journal of Preventive Medicine of Chinese People's Liberation Army, 2019, 37(4):81-83.

[3] Lai ZJ, Liu LT, Li Z, et al. Effects of Qushi Chubi Decoction combined with acupuncture on TGF-$ $1, COX-2, IL-23, NO and lumbar function in patients with cold-dampness blockage type lumbar disc herniation [J]. Acta Chinese Medicine, 2022, 37(4):863-868.

[4] Jing C, Xiao N, Yu HJ, et al. Effect of umbilical moxibustion on phlegm-dampness constitution and intestinal flora of subjects [J]. Chinese Acupuncture

& Moxibustion, 2021, 41(12):1360-1364,1382.

[5] Spinal Surgery Group of Orthopedic Branch of Chinese Medical Association, Orthopedic Rehabilitation Group of Orthopedic Branch of Chinese Medical Association. Guidelines for the diagnosis and treatment of lumbar disc herniation [J]. Chinese Journal of Orthopaedics, 2020, 40(8):477-487.

[6] Qiu JX, Deng XZ, Xiao BQ. Effect of staged core exercise combined with pain nursing on patients with lumbar disc herniation and its influence on pain degree [J]. Nursing of Integrated Traditional Chinese and Western Medicine (Chinese-English), 2023, 9(5):73-75.

[7] Li W, Li B, Wu XH, et al. Effects of Tiaodu Lijin acupuncture combined with lumbar core muscle strength training on lumbar function, lumbar back muscle mechanical effect and serum inflammatory factors in patients with lumbar disc herniation [J]. Progress in Modern Biomedicine, 2023, 23(6):1126-1130.

[8] Zhang XN, Ren JP, Liu XM. Analysis of the application effect of Jiaji point acupuncture combined with lumbar and back muscle exercise in patients with lumbar disc herniation [J]. Guizhou Medical Journal, 2022, 46(3):401-402.

[9] Feng CB, Zhao AX, Li YK, et al. Observation on the treatment of cold-dampness blockage type lumbar disc herniation with compound Wutou microemulsion [J]. Chinese Archives of Traditional Chinese Medicine, 2019, 37(12):2994-2998.

[10] Guo QY. Application analysis of TCM emotional nursing in patients with thoracolumbar compression fracture constipation treated with Bianshi umbilical moxibustion [J]. Journal of Shenyang Pharmaceutical University, 2021, 38(2):65-67.

[11] Wu J, Liu CY, Zhou JJ. Analysis of clinical effect of umbilical moxibustion combined with acupuncture in treating patients with lumbar disc herniation [J]. Medical Frontier, 2022, 12(11):121-123.

[12] Zhang CG, Zhang K, Wang TH, et al. Efficacy of Yashu Zhibi Formula in treating kidney deficiency and cold-dampness type lumbar disc herniation and its effect on inflammatory factors and pain substance expression [J]. Modern Journal of Integrated Traditional Chinese and Western Medicine, 2021, 30(25):2769-2772,2776.

Note: Figure translations are in progress. See original paper for figures.