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Original Article

Effects of Huolong moxibustion on discogenic low back pain

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Abstract: Objective: The goal of this study was to investigate the effect of Huolong moxibustion in the treatment of discogenic low back pain (DLBP) and its underlying mechanisms. Methods: One hundred and forty-eight patients with DLBP treated in the Orthopedics Department of Tangshan Gongren Hospital were selected and randomly divided into the observation group and control group. Patients in the control group were treated with regular treatment such as conventional traction and manual massage physiotherapy, while those in the observation group were treated with Huolong moxibustion based on the treatment in control group for 3 weeks. The two groups were compared in the treatment effect of DLBP, and visual analogue scale (VAS) score, Japanese Orthopedic Association (JOA) score, oswestry disability index (ODI) score, 36-Item Short-Form Health Survey (SF-36) score and serum inflammatory factors. Results: At 3 weeks after treatment, the total effective rate was 97.37% in observation group and 88.39% in control group, and there was a statistical difference between two groups (P=0.04). At 3 weeks after treatment, VAS score and ODI score in the observation group were remarkably lower than those in the control group (both P<0.001); JOA score and SF-36 score were also significantly increased (both P<0.001). Additionally, interleukin-2 (IL-2), IL-10, and tumor necrosis factor α (TNF-α) in the observation group was significantly lower than those in the control group (P<0.001). Conclusion: Huolong moxibustion shows efficacy in the treatment of DLBP, which is helpful to alleviate the symptoms of lumbago and improve the quality of life of patients. This might be associated with lower serum IL-6 and TNF-α expression levels.

Keywords: Huolong moxibustion, DLBP, curative effect, inflammatory factor

Introduction

Discogenic low back pain (DLBP) refers to the stimulation of lesions in lumbar intervertebral disc structure against pain receptors in the intervertebral disc, resulting in low back pain, which is also known as internal disk derangement, including changes in intervertebral disc structure, and metabolic dysfunction [1, 2]. For example, aseptic inflammation of the intervertebral disc stimulates the pain receptors, and ruptured annulus fibrosus also stimulates pain receptors, leading to low back pain [3, 4]. In terms of treatment, traction, massage and manual massage are dominated, but treatment effects are not satisfactory for some patients. Huolong moxibustion is a new therapy developed based on moxibustion therapy and fumigation and steaming therapy in traditional Chinese medicine [5]. Nevertheless, the efficacy of Huolong moxibustion therapy in treatment of DLBP remain unclear. Therefore, the present study was aimed to investigate the effect of Huolong moxibustion in the treatment of DLBP in Tangshan Gongren Hospital, providing supportive evidence for clinical treatment of the disease.

Materials and methods

Patients

This study was approved by the Ethics Committee of Tangshan Gongren Hospital and patients and their families gave written informed consent. In total, 148 patients with DLBP treated at the department of Traditional Chinese Medicine of Tangshan Gongren Hospital from February 2016 to May 2017 were selected. Inclusion criteria: 1) Patients meeting the diagnostic criteria of DLBP; 2) The age of patients ranged from 18 to 60 years old; 3) Patients' participation in this study was completely voluntary. Exclusion criteria: 1) Patients accompa-

nied with infection, a history of vertebral fracture, ankylosing spondylitis, or protruded intervertebral disc; 2) Patients had a history of psychotic symptoms; 3) Patients with incomplete clinical data or poor treatment compliance; 4) Patients who quit halfway. The patients were assigned randomly into the observation group (n=76) and the control group (n=72).

Treatment methods

The control group was treated with regular treatment such as conventional traction and manual massage. The traction detail was as followings: Under a supine position, the pelvis was fixed using traction belt and chest strap. According to the patient's weight and individual difference, the traction mass was determined, mostly 7-15 kg on each side, and the traction mass was gradually increased on the basis that the patient could tolerate it. Traction was performed for about 60 minutes each time twice a day at an interval of 4-6 hours. After traction, patients rested on the bed for 20-30 minutes, and then got out of bed for 3 consecutive weeks. The manual massage detail was as followings: Under a prone position, the back of patients was rolled, pressed, kneaded and clamped for 30 minutes each time once a day for 6 consecutive days, after which it was performed for 3 consecutive weeks.

The observation group was treated with Huolong moxibustion based on the treatment of control group: first, Huolong decoction was prepared using prescriptions: Eucommia ulmoides, Salvia miltiorrhiza, Angelica sinensis, Caulis Spatholobi, Panax notoginseng and Carthamus tinctorius (30 g), Herba Taxilli, Radix Paeoniae Alba, Fructus Chaenomelis, Radix Angelicae Pubescentis, Rhizome of rehmannia, Folium Artemisiae Argyi and Radix Aconiti (15 g), Ptyas dhumnades and Chinese parsnip root (10 g), and 3 centipedes. The decoction was 300 mL. The gauze strip was soaked in Huolong decoction, and then under a prone position, patients were disinfected along the governor meridian, the gauze strip was placed, and the wet towel was placed on the gauze. Anhydrous alcohol was sprayed on the towel along the gauze, and then Huolong was fired, respectively, under slow fire, slow fire, and warm fire. Patients should feel warm and comfortable, feel burning but can tolerate it without bubbles. After that, patients were asked to give up raw or cold food, drink warm water, and keep warm. The treatment was performed when patients were assigned into the observation group, and it was once a day for 6 consecutive days, and then patients rested for 1 day. The time of total therapy was 3 weeks.

Outcome measures

The comparison of response to clinical treatment was performed between two groups at 3 weeks after treatment. The criteria for clinical response was as follows: the ineffective result means there was no obvious improvement in relevant symptoms and signs or even worse. Additionally, the patient can't work and live well. Effectivity was characterized with light lumbago occasionally and mild work and activity are feasible. Cure indicated relevant pain symptoms disappear, daily exercise is not limited, and the waist can move normally. The patients can work and live normally [6, 7]. Overall response rate = (cases number of effectivity and cure)/total cases * 100%.

The lumbago degree of patients before and at 3 weeks after treatment was evaluated by VAS score and JOA score [8, 9]. The comparison of VAS score and JOA score was performed between two groups. The score range of VAS was 0 to 10. Higher scores indicated a worse result. The score range of JOA was 0 to 29. Higher scores showed a better result.

ODI score was applied for evaluating the dysfunction of DLBP patients before and at 3 weeks after treatment [10]. ODI score included ten items such as pain intensity, performance state, walking, standing, etc. The score range of each item was 0 to 5. The method of calculation was as follows: Scores = practical score/50 * 100%. Higher scores indicated worse dysfunction for patients.

SF-36 health questionnaire was used to evaluate the patients' quality of life before and at 3 weeks after treatment [11]. The scoring range of SF-36 was from 0 to 100. Higher scores indicated better quality of life for patients. SF-36 health questionnaire mainly included physical health and mental health. Physical health included body pain, physical activity, work efficiency and general health status. Mental health included social skills, mental condition, vitality and emotional state. The comparison of SF-36 score was performed between two groups.

The serum levels of IL-2, IL-10, and TNF-α of all patients before and at 3 weeks after treatment

Table 1. Comparison of general data of two groups of patients

Group	Observation group	Control group	t/χ^2 value	*P* value
Cases (n)	76	72		
Male/Female (n)	43/33	40/32	0.016	0.900
Age (year)	37.8±6.3	37.5±6.1	0.294	0.769
Hypertension (n)	22	17	0.543	0.461
Diabetes (n)	16	13	0.211	0.646
Hyperlipidemia (n)	14	10	0.559	0.455
Course of disease (months)	29.7±3.5	29.4±3.4	0.529	0.598
Site of lesion			1.683	0.431
L3/L4	20	15		
L4/L5	30	25		
L5/S1	26	32		

Note: L3/L4: Intervertebral disc between lumbar 3 and lumbar 4. L4/L5: Intervertebral disc between lumbar 4 and lumbar 5. L5/S1: Intervertebral disc between lumbar 5 and sacrum 1.

Table 2. Comparison of response rate for discogenic low back pain between two groups

Curative effect	Observation group (n=76)	Control group (n=72)
Cure	32 (42.11%)	23 (31.94%)
Effective	42 (55.26%)	41 (56.94%)
Ineffective	2 (2.63%)	8 (11.11%)
Total effective cases	74 (97.37%)*	64 (88.89%)

Note: In the comparison between the two groups, χ^2=4.220, *P=0.04.

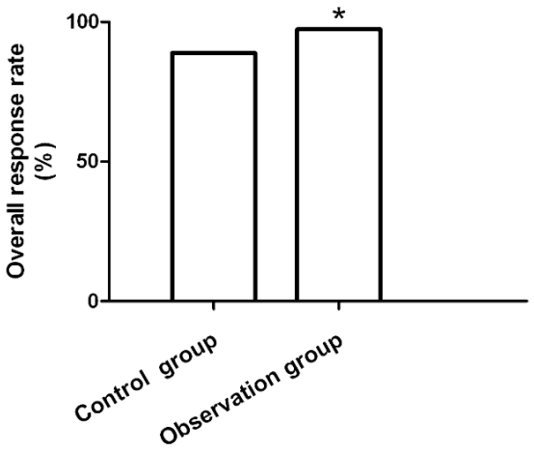

Figure 1. Overall response rate between two groups. Compared with control group, *P<0.05.

were measured as follows: 5 mL of fasting peripheral venous blood was extracted from each patient before treatment and 3 weeks after treatment, and then placed in an anticoagulant tube. It was centrifuged at 2,500 r/min for 15 minutes. The serum was stored at -20°C after separation. The serum levels of IL-2, IL-10, and TNF-α were detected by the method of enzyme-linked immunosorbent assay (ELISA) through IL-2, IL-10, and TNF-α kits. The kits were purchased from company of R&D science in USA. The above experimental procedures were performed strictly according to the instructions as shown in the kits.

Statistical methods

SPSS 21.0 software was applied. The data of measurement are expressed as mean ± SD. Count data was expressed as rates. Chi-square test was used for the comparison of enumeration data, while student's t-test was used for the comparison of measurement data. The intragroup comparisons before and after treatment were conducted by a paired t-test. P<0.05 indicated that there was significantly statistical difference.

Results

Patients' characteristics

There was no significant difference in basic information such as age, gender, course of disease, hypertension, diabetes, hyperlipidemia and site of lesion between the test group and the control group (all P>0.05) as shown in **Table 1**.

Comparison of total effective rate of treatment between the two groups

Compared with patients from the control group, at 3 weeks following treatment, the overall response rate in observation group was significantly higher, and there was statistical difference between two groups (P=0.04), as shown in **Table 2** and **Figure 1**. In detail, there were more patients with cure response in the observation group compared with that in the control group. In contrast, the ineffective response rate in observation group was significantly lower than that in the control group.

Comparisons of VAS score and JOA score between the two groups

Before treatment, there was no significantly statistical difference for VAS score and JOA

Table 3. Comparisons of VAS score and JOA score between the two groups

Group	Observation group	Control group	t value	*P* value
Cases (n)	76	72		
VAS score				
Before treatment	6.43±0.54	6.34±0.59	0.969	0.334
3 weeks after treatment	1.51±0.24***,###	2.49±0.37***	19.216	<0.001
t value	72.580	46.910		
P value	<0.001	<0.001		
JOA score				
Before treatment	9.32±1.78	9.50±1.84	0.605	0.546
3 weeks after treatment	21.87±2.33***,###	18.54±2.65***	8.129	<0.001
t value	37.310	23.780		
P value	<0.001	<0.001		

Note: Compared with before treatment, ***P<0.001; compared with control group at the same time point, ###P<0.001. VAS: visual analogue scale; JOA: Japanese Orthopedic Association.

score between the two groups. Compared to before treatment, the VAS score in the two groups was significantly lower and JOA score was markedly higher after treatment. There was a statistically significant difference. At 3 weeks after treatment, VAS score in observation group was markedly lower than that in control group, the JOA score was higher than that in control group. Additionally, there was significant difference (P<0.001), as shown in **Table 3**.

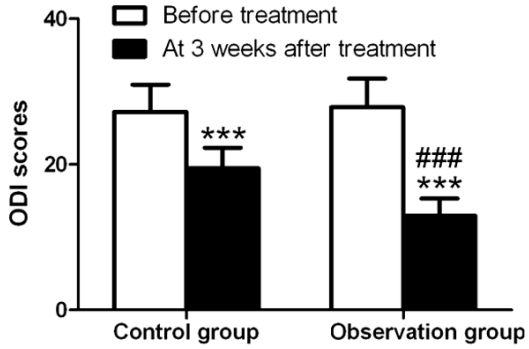

Figure 2. ODI score was compared between the two groups. Compared with before treatment, ***indicated P<0.001; compared with the control group at 3 weeks after treatment, ###indicated P<0.001. ODI: Oswestry disability index.

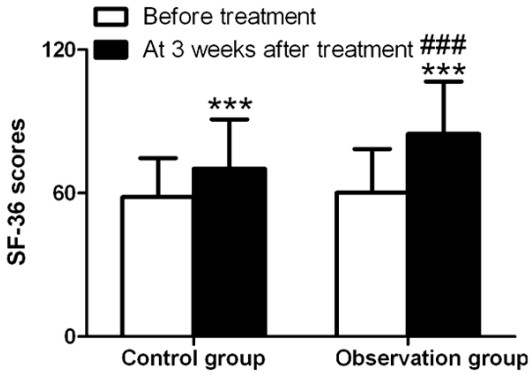

Figure 3. SF-36 score was compared between two groups. Compared with before treatment, ***indicated P<0.001; compared with the control group at 3 weeks after treatment, ###indicated P<0.001. SF-36: 36-Item Short-Form Health Survey.

Comparison of ODI score between the two groups

No significant differences were noted in the term of ODI score between two groups before treatment, but striking differences were found before vs. after treatment (all P<0.001). At 3 weeks after treatment, the ODI scores in the observation group was markedly lower than that in the control group (P<0.001), as shown in **Figure 2**.

Comparison of SF-36 score between the two groups

There was no statistical difference in the term of SF-36 scores before treatment between two groups (60.17±18.24 vs. 58.36±16.27, t= 0.636, P=0.526). Compared to before treatment, the score of SF-36 was significantly higher after treatment in the two groups, and the differences were statistically significant (both P<0.001). The significant difference was found for the SF-36 score at 3 weeks after treatment between two groups (84.76±21.89 vs. 70.19± 20.65, t=4.160, P<0.001) as shown in **Figure 3**.

Comparison of IL-2, IL-10, and TNF-α levels between the two groups

There were insignificant disparities in the levels of IL-2, IL-10, and TNF-α between the two groups before treatment. At 3 weeks after treatment, lower serum IL-2, IL-10, and TNF-α levels were observed in the two groups than those before

Table 4. Comparison of IL-2, IL-10, and TNF-α levels between the two groups

Group	Observation group	Control group	t value	*P* value
Cases (n)	76	72		
IL-2 (ng/mL)				
Before treatment	109.75±26.53	110.62±27.42	0.196	0.845
3 weeks after treatment	62.68±12.61	84.71±15.72	9.428	<0.001
t value	13.970	6.956		
P value	<0.001	<0.001		
IL-10 (ng/mL)				
Before treatment	4.57±1.10	4.53±1.00	0.231	0.818
3 weeks after treatment	2.57±0.61	3.19±0.82	5.237	<0.001
t value	13.860	8.792		
P value	<0.001	<0.001		
TNF-α (ng/mL)				
Before treatment	1.06±0.32	0.98±0.29	1.591	0.114
3 weeks after treatment	0.49±0.11	0.67±0.1	9.110	<0.001
t value	14.690	8.277		
P value	<0.001	<0.001		

Note: IL-2: interleukin-2; IL-10: interleukin-2; TNF-α: tumor necrosis factor α.

treatment (all P<0.001), and the levels of serum IL-2, IL-10, and TNF-α in the observation group were substantially lower than those in the control group (all P<0.001; **Table 4**).

Discussion

The epidemiological survey showed that DLBP is prevalent in the world, whose incidence rate is very high [12]. There is a probability of 70%-85% of lumbago in a certain period of life, among which about 18% patients suffer from lumbago for a long time. Most patients can recover and return to work spontaneously, while the disease in 7% patients will gradually develop into chronic lumbago, seriously disturbing normal life [13, 14]. Manipulation, massage, traction, and other conservative treatment promote self-healing of intervertebral disc in patients through loosening tissues, promoting blood circulation, setting bones and treating injured soft tissues, thus relieving the pain. Conservative treatment can relieve pain in patients temporarily, but the degenerative disc cannot be repaired, pathological state of disc cannot be changed and the inflammatory response is not eliminated without satisfactory effect [15, 16].

In traditional Chinese medicine, DLBP is dominated by blood stasis and cold dampness [17]. The pain could be caused by the stagnation or incompatibility. The treatment of traditional Chinese medicine for DLBP is based on promoting circulation and removing stasis, and activating collaterals [5]. Governor meridian is one of the eight extra channels in the human body, which reaches the brain via marrow, gathers yang in the whole body and serves as the main channel for transmission of vital essence. Furthermore, it can compress the fire from the gate of life, and warm the organs. Due to changes in the structural function of intervertebral disc, poor transmission of vital essence, lack of qi, and insufficient gasification occur in governor meridian of DLBP patients under the stimulus of torsion and shear, eventually leading to qi deficiency and blood stasis [18]. Waist is the house of kidney, governor meridian walks in the ridge, and kidney attaches on both sides. Bladder meridian connects to the kidney, so lumbago is closely related to relation between kidney and bladder meridian [19]. Huolong moxibustion was developed based on the traditional moxibustion, which is a persistent needle warming moxibustion therapy. Huolong decoction prepared in Tangshan Gongren Hospital has effects of dispelling wind and eliminating dampness, eliminating cold to stop pain, and tonifying the liver and kidney [5]. Under the hyperthermia of moxibustion, it enhances local cell phagocytosis, improves local blood circulation, reduces nervous excitation, reduces nerve inflammatory response, and relieves pain [20]. Moxibustion promotes the penetration of the active ingredients into the body via hyperthermia, so as to soothe the channels and quicken the network vessels, reinforce the kidney and tonify yang, strengthen the spleen and stomach [21]. Moreover, drug fumigation and acupuncture stimulation are combined to warm and smooth, adjust and reinforce, so that drugs and warmth can reach the depth more easily, accelerate blood circulation, promote metabolism, alleviate local edema, congestion, inflam-

matory exudation and other pathological changes, promote the repair of damaged disc tissues, and completely eliminate the pathogenesis, thus improving the therapeutic effect [22].

Results in this study show that the total effective rate of treatment in observation group was higher than that in the control group, and the VAS score and ODI score was lower than that in the control group, but the JOA score and SF-36 was higher than that in the control group. It was confirmed that the application of Huolong moxibustion is beneficial to improve the treatment effect, relieve the lumbago symptoms of DLBP patients and improve the life quality quickly and safely. It is similar to those reported by previous studies [23, 24]. The current study revealed that some inflammatory factors were released due to abnormality of internal structure and metabolic function in intervertebral disc such as degeneration and endplate injury and stimulated the pain receptors in intervertebral disc, which was considered as the main mechanism of pain in DLBP patients [25]. The levels of inflammatory reactions such as IL-2, IL-10, and TNF-α were strikingly increased in DLBP patients [26]. This study showed that patients in the observation group had lower levels of IL-2, IL-10 and TNF-α than those in the control group, showing Huolong moxibustion treatment is effective in reducing inflammatory reactions, which is consistent with that reported by [27].

In conclusion, Huolong moxibustion treatment for DLBP patients was associated with a better therapeutic effect, fewer symptoms of lumbago, improved quality of life, and lower serum IL-2, IL-10, and TNF-α levels. Therefore, it is worthy of clinically extensive application. However, there are some limitations in the present study, including the small sample size, relatively limited source of cases, and absence of long-term follow-ups. Moreover, this study does not elucidate the changes of the index at the different time point, the specific mechanism for Huolong moxibustion leading to decline of inflammatory factors, and the clinical effect of different course of Huolong moxibustion for DLBP. In the future, a multicenter, randomized controlled study with large sample size is needed for further validation.

Disclosure of conflict of interest

None.

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