

Zhang's bone-setting Caiqiao massage therapy for the treatment of 80 pain-dominant non-acute lumbar disc herniation cases

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Abstract

Objectives: To observe the curative effects of Zhang's bone-setting Caiqiao massage therapy on pain-dominant non-acute lumbar disc herniation.

Methods: Between January 2015 and August 2016, 80 patients with lumbar disc herniation who were admitted to the Outpatient Department, Yueyang Hospital of Traditional Chinese Medicine were enrolled. The patients were then randomly divided into the treatment group (Zhang's bone-setting Caiqiao massage group, n=40) and the control group (conventional massage group, n=40). Both groups received massage therapy with a course of 10 times, 20min/time. The following data were obtained from the two groups before and after treatment: straight leg raising test, numerical rating scale, Aberdeen back pain scale, the Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire, as well as curative effect analysis.

Results: Intra-group comparisons showed significant differences in the symptoms before and after treatment in both the groups (P<0.05). Also, the difference between the two groups was statistically significant (P<0.05).

Conclusions: Both Zhang's bone-setting Caiqiao massage and the conventional massage showed a significant effect on lumbar disc herniation. Zhang's bone-setting Caiqiao massage is a more effective for the treatment of lumbar disc herniation compared with the conventional massage.

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Introduction

Lumbar disc herniation is a common and frequently disease occurring in the Acupuncture and Manipulation Department. This disease is a recurrent, persistent and refractory condition that severely affects the individual's quality of life and work. Massage is a common method for treatment of lumbar disc herniation. Zhang's bone-setting school is one of the top ten bone injury setting schools in China. It was first introduced by the founder Ruilin Zhang, and was reorganized by the successor Professor Xueyu Jiang, and together has formed Zhang's bone-setting Caiqiao massage therapy. This method is a combination of bone-setting massage and Caiqiao, and also is a combination of hand and foot manipulations. Due to the specificity of lumbar disc structure, routine manipulation is usually ineffective in the treatment of lumbar disc herniation. Meanwhile, Ruilin Zhang has put forward the concept of three-dimensional bone-setting, which was combined with the foot manipulation. This method meant to utilize the big force of Caiqiao, which in turn showed significant effect. Earlier studies have shown that Zhang's massage can be used for the treatment of lumbar disc herniation, but the curative effects and safety lacks confirmation in RCT studies. Hence, this study aimed to clinically analyze patients with non-acute lumbar disc herniation to verify the advantages of Zhang's bone-setting Caiqiao massage for the treatment of lumbar disc herniation compared to the conventional massage.

Methods

Patients

Between January 2015 and August 2016, 80 patients with lumbar disc herniation who were admitted to the Outpatient Department of Yueyang Hospital of Traditional Chinese Medicine were included. They were randomized into the treatment group (Zhang's bone-setting Caiqiao massage group, n=40) and the control group (conventional massage group, n=40) using a random number method. Starting from the 3rd line of the random number table 1, numbers smaller than 80 were considered as the no. of enrolled patients, whereas the first 40 numbers were selected for the treatment group, and the latter 40 numbers were selected for the control group. In the treatment group, there were 21 men and 19 women, aged 22-60 years (with the mean age of 32 years) and disease course of 93 days-3 years (with the mean course of 10.2 months). There were 10 cases with mild symptoms (+) and with a pain rating index (PRI) of 1-6 points, 12 cases with middle

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symptoms (++) and with a PRI of 7-12 points and 18 cases with severe symptoms (+++) and with a PRI >12 points. In the straight leg raising test, there were 20 severe cases that had an angle smaller than 30°, 10 middle cases that had an angle of 30°-60° and 10 mild cases that had an angle of 60°-90°. In the conventional massage group, there were 20 men and 20 women, aged 24-56 years (with the mean age of 31 years) and disease course of 92 days-3.2 years (with the mean course of 11.6 months). There were 11 cases with mild symptoms (+) and with a PRI of 1-6 points, 13 cases with middle symptoms (++) and with a PRI of 7-12 points and 16 cases with severe symptoms (+++) and with a PRI >12 points. In the straight leg raising test, there were 19 severe cases that had an angle smaller than 30°, 11 middle cases who had an angle of 30°-60° and 10 mild cases who had an angle of 60°-90°. Thus, there was no significant difference in gender, age, disease course and other general data between the two groups ($P>0.05$).

Diagnostic criteria

Patients were diagnosed according to the diagnostic criteria for lumbar disc herniation in Standard of diagnosis and curative effect of TCM Syndrome [1].

Inclusion criteria

(1) Accorded with the diagnostic criteria for lumbar disc herniation. (2) With the age of 18~65 years. (3) Completed the course of treatment and follow-up. (4) Non-acute onset patients with a disease course longer than 3 months or onset time more than 3 months, and a PRI of 4-6, which were dominated by moderate pain. (5) Discontinued other therapies during the study period. (6) Voluntarily participated in the study and signed informed consent.

Exclusion criteria

(1) Patients with severe lumbar disc herniation accompanied by significant nerve injury symptoms and signs. (2) Patients with tumors or bone tuberculosis. (3) Patients with severe medical disease, or mental disease or infectious disease. (4) Pregnant or lactating women.

Withdrawal criteria

(1) Patients who were inappropriate for continuing the study due to serious adverse reactions or special physiological changes during pregnancy. (2) Patients who failed to complete a course of treatment for personal reasons.

Conventional massage [1]

Manipulation was mainly applied on bladder channel of foot Taiyang: the acupuncture point was first relaxed by pointing, pressing and by other means, which was then followed by rotatory manipulation, each for the left and right lateral position, and then the therapy was terminated by slapping the waist for 5 min. Patients were treated once per day with a course of treatment for 10 times.

Zhang's bone-setting Caiqiao massage

Patients received stamping massage therapy after conventional massage, which included pointing, rolling, shaking, kneading, shuddering, etc. The specific operations were as follows: patients were placed in prone position, gently pointing, rolling, kneading and shaking massages were applied successively to the ipsilateral hip and to the lower extremity. Then shuddering massage was applied to the middle part of the upper and lower spinal chords of the lumbar disc herniation segment, each by stamping massage which lasted for 3 min. All the patients received treatment once per day with a course of treatment for 10 times.

Results

The major analysis included straight leg raising test, numerical rating scale, Aberdeen back pain scale, the Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire, as well as curative effect analysis.

Lumbar disc herniation pain was classified according to the internationally recognized Numerical rating scale 2

Mild pain (+) refers to the pain in supine position, as well as when turning over, coughing and deep breathing and with a PRI score of 1-3 points; moderate pain (++) refers to the pain in supine position that affects the sleep and with a PRI score of 4-6 points; severe pain (+++) refers to unbearable pain during flipping and uneasiness, being unable to sleep and sweating all over the body and with a PRI score of 7-10 points.

Aberdeen back pain scale

Each question was scored according to the symptoms, which included pain and numbness in the back and leg (0-39 points), functional disorders (0-19 points) and living conditions (0-18 points), where a higher score denoted more severe pain.

Roland Morris Disability Questionnaire (RMQ)

RMQ consists of 24 true or false questions, aiming to evaluate the self-perception disability in patients, where a higher score indicated more significant disability.

3.4 Oswestry Disability Questionnaire (ODI)

ODI consists of 10 questions, which involves lifting, walking ability, social life, sexual behavior, sleep cycle and other contents in addition to the degree of pain evaluation.

Criteria of curative effect

Curative effect was evaluated by referring to the Criteria of diagnosis and therapeutic effect of diseases and syndromes in traditional Chinese medicine 2, which was published by the State Administration of Traditional Chinese Medicine in 1994.

Cure is defined as follows: disappearance of original symptoms, normal muscle strength, restoration of waist and leg function to normal level, participation of patients in normal exercise and work. The change rate of straight leg raising angle or reduction rate of Numerical rating scale is greater or equal to 95%. (2) **Significant effect:** the original symptoms and pain are significantly alleviated, while waist and leg function are significantly improved. The change rate of straight leg raising angle or reduction rate of Numerical rating scale is greater or equal to 70% and smaller than 95%. (3) **Improvement:** The original symptoms are alleviated; pain and limb function are insignificantly improved. The change rate of straight leg raising angle or reduction rate of Numerical rating scale is greater or equal to 30% and smaller than 70%. (4) **Non-effect:** symptoms are not improved, and the change rate of straight leg raising angle or reduction rate of Numerical rating scale is smaller than 30%. According to the Nimodipine method, the change rate of straight leg raising angle or reduction rate of pain scale score is given by the formula: $[(\text{pre-treatment score} - \text{post-treatment score}) / \text{pre-treatment score}] \times 100\%$.

Statistical analysis

Statistical analyses were performed using SPSS 16.0 software. Continuous variables which were in line with normal distribution were expressed as mean \pm SD and were analyzed using t-test or ANOVA.

Continuous variables which were in line with non-normal distribution were expressed as median (range or IQR) and were analyzed using Mann-Whitney U or Kruskal-Wallis test. Categorical variables were analyzed using chi-square test or Fisher exact test. A difference of $P < 0.05$ was considered to be statistically significant.

Therapeutic outcomes

Enrollment flowchart

Baseline data (Table 1)

Comparison of outcomes

Qualitative data were expressed as “frequency (percentage)” and were compared using chi-square/Fisher exact test. Quantitative data was first conducted normality test, and those in accordance with normal distribution were expressed as “mean ± standard deviation” and were compared using t-test, while those in accordance with non-normal distribution were described as “median (range)” and were compared using non-parametric Mann-Whitney U test.

As seen from Table 2, there was no significant difference observed in each indicator between the treatment group and control group before treatment, while significant difference ($P < 0.05$) was observed between the two groups after treatment. In the two groups, variations in the values before and after treatment showed statistically significant difference ($P < 0.05$).

If the curative indicators were classification data, they were compared between the groups using non-parametric Mann-Whitney U test. Meanwhile, the total efficiencies were compared between the two groups using chi-square test.

As observed from Table 3, the curative effect showed a statistically significant difference ($P < 0.05$) between the two groups.

Adverse reactions

No adverse reactions were observed in this study.

Discussion

Clinically, lumbar disc herniation mainly manifests as lumbago, sciatica, lower abdominal pain or anterior thigh pain, intermittent claudication, numbness of lower limbs, muscular dystrophy, etc., which seriously affects individual's normal life and work. In the recent years, the incidence of this disease has increased year by year in our country. Therefore, clinical studies on lumbar disc herniation are getting more important, which in turn demonstrates practical significance [2]. Lumbar disc herniation can be divided into acute and non-acute phases according to the onset of circumstances, and can be divided into pain-dominant, numbness-dominant and myasthenia gravis-dominant according to its main symptoms [3]. Acupuncture, massage, traction and physical therapy are the major clinical treatments for lumbar disc herniation. Of these, electroacupuncture [4] is a commonly used method, which can obtain quantitative results to facilitate observation of clinical effectiveness. Since lumbar disc herniation is an intervertebral disc herniation disease that occurs due to the vertebral instability caused by the imbalance in strength of lumbar and back muscle group, which produces symptoms of nerve root irritation. Acupuncture and electroacupuncture alone lack the means to restore the position relationship between the vertebrae and lumbar discs [5]. In the meantime, massage therapy has prominent therapeutic advantages

in eliminating inflammation, loosening adhesion, correcting internal and external balance of the spine as well as reducing the pressure within the lumbar discs, which can effectively solve the problem clinical pain within a low cost.

Table 1: Baseline data

	Zhang's massage	Normal massage
	N=40	N=40
Male	21	20
Female	19	20
Mean age (year ± se)	32	31
Duration of complaint		
3-6 mo	25	24
6-12 mo	11	11
>12 mo	4	5
Level of LDH		
L3/4	11	10
L4/5	22	23
L5/S1	7	7
Medicine at intake		
None	34	33
Over the counter only	4	5
Prescription non-narcotics	1	1
narcotics	1	1
smokers	17	16
Employment mode		
N/A	21	20
Employee	16	15
self -Employed	3	5
Work status		
employed	23	22
Medical leave	5	6
unemployed	12	12
Work duties		
sedentary	12	12
Manual labor	21	20
Insurance status		
Workers compensation	25	26
3 rd party disability insurance	3	4
Private/self-insurance	12	10

*Abbreviations: SE: standard error; LDH: lactate dehydrogenase; N/A: Not applicable

Table 2: Observation index statistics

Group	Control group	Treatment group	P
Pre-treatment straight leg raising angle	45(10,60)	45(10,60)	0.853
Post-treatment straight leg raising angle	61.5(16,90)	75.5(17,90)	0.007
Change of straight leg raising angle (%)	40(15.56,226.09)	67.78(13.64,800)	0.002
Pre-treatment Numerical rating scale	6(4,9)	6(4,10)	0.906
Post-treatment Numerical rating scale	4(0,6)	2(0,4)	0.000
Pain improvement (%)	41.43(16.67,100)	73.21(0,100)	0.001
Pre-treatment Aberdeen back pain scale	41.5(31,66)	42(31,69)	0.942
Post-treatment Aberdeen back pain scale	22(0,52)	11.5(0,43)	0.001
Change of Aberdeen back pain scale (%)	42.26(0,100)	75.68(0,100)	0.001
Pre-treatment roland-morris	17(12,23)	17(10,24)	0.931
Post-treatment roland-morris	9(0,17)	4(0,15)	0.001
Change of roland-morris (%)	43.17(16.67,100)	72.08(0,100)	0.001
Pre-treatment Oswestry	26(12,40)	29.5(11,48)	0.363
Post-treatment Oswestry	15(0,32)	6.5(0,38)	0.005
Change of Oswestry (%)	45.33(16.22,100)	73.21(0,100)	0.002

A difference with $P < 0.05$ is considered statistically significant. Change=[pre-treatment score-post-treatment score]/ pre-treatment score *100%

Table 3. Curative effect analysis.

Group	Control group	Treatment group	P
Straight leg raising			0.020
Ineffective	12(30.0%)	2(5.0%)	
Effective	18(45.0%)	20(50.0%)	
Significantly effective	5(12.5%)	7(17.5%)	
Cured	5(12.5%)	11(27.5%)	
Straight leg raising			0.003
Ineffective	12(30.0%)	2(5.0%)	
Effective	28(70.0%)	38(95.0%)	
Numeric rating scale			0.011
Ineffective	10(25.0%)	2(5.0%)	
Effective	20(50.0%)	16(40.0%)	
Significantly effective	5(12.5%)	7(17.5%)	
Cured	5(12.5%)	15(37.5%)	
Numeric rating scale			0.012
Ineffective	10(25.0%)	2(5.0%)	
Effective	30(75.0%)	38(95.0%)	

From the above figure, we can see the total effective of caiqiao massage treatment group is 95%, it is much better than that of control group* 75%, the difference of 20% normal needs 40 samples each group. there is the statistical significance, A difference with P<0.05 is considered statistically significant.

Bladder Meridian of Foot-Taiyang is a commonly used point in the treatment of lumbar disc herniation and has been confirmed to have a good curative effect in clinical practice. This is because of the presence of posterior branches of the 4th and 5th lumbar nerves as well as branches and offshoots of dorsal branches of the 4th and 5th lumbar artery and veins in the deep part of two sides of Da Chang Shu (BL25) and Guan Yuan Shu (BL26). Massaging Da Chang Shu and Guan Yuan Shu can better clear the Taiyang meridian, which in turn is able to invigorate waist and knees as well as robust kidney-Qi. Since the sciatic nerve and femoral nerve go through Huantiao point (GB30) and Weizhong point (BL40), these two points are considered as acupoints for effective treatment of lumbago and sciatica, and for which “Weizhong point can be used for treatment of lumbar and back meridian diseases” is the best summary [6].

In modern medicine, the analgesic mechanism of massage for the treatment of lumbar disc herniation can be illustrated from two aspects: Firstly, in terms of neurovasology, the posterior median branch of the spinal nerve and its branches form a neural network, sympathetic trunks are distributed on both sides of the spine, and the sympathetic fibers are connected to the spinal nerve through the communicating branch at which Beishu and Jiaji points are located. Massage can stimulate the posterior branch of the spinal nerve at the lesion site, stimulate the ganglion, sympathetic nerve and other deep receptors, resulting in the analgesic effect through complex pain regulation mechanism. In addition, massage can also stimulate the artery and vein that accompany the posterior branch of the spinal nerve, decrease permeability of blood capillary vessels, inhibit release of inflammatory algogenic substance, promote acceleration of local blood circulation, alleviate nerve root edema and thereby relieve the symptoms. Secondly, in terms of humoral regulation: (1) Massage can promote release of enkephalin, dynorphin, β-endorphin and endomorphin that can regulate pain pathway and improve pain threshold, so as to achieve the best analgesic effect. (2) Serum free 5-hydroxytryptamine (5-HT) is a strong algogenic substance whose abnormal elevation is associated with pain. Massage enables the platelets to increase the absorption as well as decrease the release of 5-HT. (3) Massage can inhibit the expression of pain-induced proto-oncogene c-fos in spine caused by trauma, which thus play an analgesic effect through regulating the primary pain receptive center in the spine [7].

Massage therapy not only achieves a good short-term curative effect, but also some long-term curative effects in the treatment of lumbar disc herniation [8]. However, hand manipulation alone in clinical practice often is unable to show a good curative effect in many patients, which might be due to the strong and firm lumbar joint ligament. Meanwhile, Caiqiao massage as a kind of massage done by foot will produce great force to the back the stamping manipulation has the characteristics of great force and can be used for the treatment of lumbar disc herniation. it will release the back pain much ease than normal massage, Caiqiao can improve lumbar lordosis and lower lumbar intervertebral space height, which plays a positive role in improving the biomechanical balance of the spine, promoting loosening of the compressed nerve root and repair of the injury [9]. It may also have an effect of promoting reduction of the protruded lumbar disc. In addition, the influence of Caiqiao on changes of lumbar lordosis and lumbar intervertebral space height is closely related to the pressure. By improving the positional relationship between the spines [10], Dawei Shi, Jian Luo and Haizhi Tan, *et al.* [11] confirmed by imaging examination that stamping manipulation can effectively improve the positional relationship between the spines, which thereby promote the reduction of the lumbar disc. Caiqiao can improve the contraction strength and work efficiency of the lumbar back extensors, improve the coordination of the lumbar flexor and extensor, increase the discharge frequency of the lumbar back extensors, ease the fatigue of the lumbar muscle group, improve the imbalance of lumbar back extensors, thereby contribute to the restoration of the biomechanical features of lumbar back extensor in patients with lumbar disc herniation. This might be one of the mechanisms for the manipulation of treatment for lumbar disc herniation.

Caiqiao manipulation is based on the Traditional Chinese Medicine (TCM) theory, and is characterized by great force and big stress surface, and thus demonstrates a significant effect on lumbar disc herniation [12]. Caiqiao manipulation is one of the useful enrichment methods of TCM massage techniques. During the treatment process, based on clinical imaging data, doctors can implement four ways of diagnosis, combine hands and feet to achieve clever diagnosis and treatment, thereby increase the curative effect, shorten therapeutic time and alleviate pain in patients. Thus, it can provide practical and real help, especially in improving the positional relationship between the lumbar disc and spine, which has also been confirmed by CT and other imaging studies [13]. In clinical practice, a combination of Caiqiao manipulation with other methods, such as drugs [14], sacral canal injection [15], electric traction [16], etc., can also achieve good results.

The Zhang's bone injury school is one of the 13 bone injury schools in our country. In terms of treatment of lumbar disc herniation, Professor Ruilin Zhang experienced to emphasize qi and blood, as well as the adjustment of relationship between muscles and bones. He believed that it is essential to address the relationship between muscles and bones as well as between qi and blood in patients with lumbar disc herniation. Solid skeleton depends on pliable tendons, whereas pliable tendons also depend on solid skeleton. Blood circulation depends on qi flow, and qi flow depends on blood circulation. Especially, it is believed to be essential to confront the spine in the vertical and horizontal directions to achieve the orthopedic purpose. Also, hand manipulation alone in the treatment of lumbar disc herniation, includes the force of hands which is relatively small due to the force and action area of hands and require a strong fixation system for the lumbar spine. Meanwhile, Caiqiao has the characteristics of big force. Therefore, a combination of hand manipulation with Caiqiao has been proposed to enhance the curative effect. With this theory, we summarized a Caiqiao massage

therapy, which mainly included point stamping, rolling stamping, shaking stamping, kneading stamping and shuddering stamping, and combined it with the conventional massage therapy to achieve the desired as well as prominent curative effect.

Conclusion

In summary, Zhang's Caiqiao massage therapy has advantages of relieving quick pain and with good curative effect in the treatment of non-acute lumbar disc herniation compared with the conventional massage therapy. However, because we did not set up a placebo control group in this study, we could not confirm whether the massage could improve prognosis of patients compared with the natural progress of the disease. Also, a long-term follow-up was not conducted, and could not confirm whether the curative effect was continued after the end of the treatment. Therefore, further in-depth studies on Caiqiao massage are necessary. However, from the point of view of clinical efficacy, it is safe and effective, and is worthy of promotion.

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Conflict of Interest

No competing financial interests exist.

Ethics approval and consent to participate

The above Trial has been approved by Ethics committee of yuyang TCM hospital (ID:hn-ll-ky-005-01).

Availability of data and materials

We state here the raw data of our study will be available to other researchers, upon reasonable request.

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