

Discussion on the application principle of tuina manipulations for lumbar intervertebral disc herniation in Chinese literatures in recent 30 years

近30年中文文献中推拿治疗腰椎间盘突出症手法应用规律探讨

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Abstract

Objective: To discuss the application principle in tuina manipulation for lumbar intervertebral disc herniation (LIDH) in Chinese literatures published in recent 30 years.

Methods: The three major Chinese databases, Wanfang Academic Journal Full-text Database (Wanfang), Chongqing VIP Database (CQVIP) and China National Knowledge Infrastructure (CNKI), were searched to collect the studies of tuina manipulations in treatment of LIDH published in recent 30 years. Clustering analysis was applied to analyze the top 20 tuina manipulations for LIDH.

Results: The top 20 most frequently used manipulations for LIDH were Gun-rolling, Rou-kneading, Dian-digital pressing, oblique Ban-pulling, An-pressing, Tanbo-plucking, Bashen-pulling and extending, horizontal Tui-pushing, Na-grasping, Anrou-pressing and kneading, Dou-shaking, Yao-rocking, Ca-scrubbing, Pai-patting, post-extension Ban-pulling, Mo-rubbing, Zhen-vibrating, Nie-pinching, fist-back Ji-tapping, and dorsal Shen-extending methods. The involved manipulations can be divided into two categories by the treated body areas. One category is applied to the soft tissues, including Gun-rolling, Rou-kneading, Dian-digital pressing, An-pressing, Tanbo-plucking, horizontal Tui-pushing, Na-grasping, Anrou-pressing and kneading, Ca-scrubbing, Pai-patting, Mo-rubbing, Zhen-vibrating, Nie-pinching, and fist-back Ji-tapping methods. The other category is applied to bones and joints, including oblique Ban-pulling, Bashen-pulling and extending, Dou-shaking, Yao-rocking, post-extension Ban-pulling, and dorsal Shen-extending methods.

Conclusion: Based on the treated body area, the tuina manipulations applied to treat LIDH are predominated by the ones performed on soft tissues, assisted by those on bones and joints. From the way of force exertion, the involved manipulations are majorly the swinging methods, followed by squeezing and pressing ones. The manipulations applied to bones and joints are predominated by the Ban-pulling ones, followed by the Bashen-pulling and extending ones.

Keywords: Tuina; Massage; Low Back Pain; Intervertebral Disc Displacement; Rolling and Rotating Manipulation; Cluster Analysis; Literature Study

【摘要】目的: 探讨近30年中文文献中推拿手法治疗腰椎间盘突出症(LIDH)的应用规律。**方法:** 在万方(Wanfang)、重庆维普(CQVIP)和中国知网(CNKI)三大中文数据库中检索近30年推拿手法治疗LIDH的文献,采用聚类统计方法分析治疗LIDH的前20种手法。**结果:** 治疗LIDH使用频次在前20位的手法依次为揉法、揉法、点法、斜扳法、按法、弹拨法、拔伸法、平推法、拿法、按揉法、抖法、摇法、擦法、拍法、后伸扳法、摩法、振法、捏法、拳背击法和背伸法。根据手法作用部位的不同,可分为2类,一类是作用于人体软组织的手法,包括揉法、揉法、点法、按法、弹拨法、平推法、拿法、按揉法、擦法、拍法、摩法、振法、捏法和拳背击法;一类是作用于人体骨与关节的手法,包括斜扳法、拔伸法、抖法、摇法、后伸扳法和背伸法。**结论:** 从手法作用部位分析,治疗LIDH的推拿手法以作用于人体软组织的手法为主,以作用于人体骨与关节的手法为辅。从手法发力特点分析,作用于人体软组织的手法中以摆动类手法为主,以挤压类手法为辅;作用于骨与关节的手法中以扳动类手法为主,以拔伸类手法为辅。

【关键词】 推拿; 按摩; 腰痛; 椎间盘移位; 揉法推拿; 聚类分析; 文献研究

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As a common cause of low back pain^[1], lumbar intervertebral disc herniation (LIDH) can bring on heavy living and economic burden to patients, families and society. With the change in life and work habits in modern time, people are more likely to be more sedentary. Without back muscle exercises, the lumbosacral region often stays in a persistent stationary strain state, leading to a constant increase in both incidence and prevalence rates of LIDH. The epidemiological survey has demonstrated that about 20% of patients with low back pain had a history of LIDH, among which, over 80% are 20-50 years old, with a male-female ratio of 3:2, and the heavy-loaded labor workers and those need to sit for long time are predominant, accounting for 58.1%^[2].

Traditional Chinese medicine (TCM) has accumulated rich experience in treating LIDH. Despite the variety of treatment methods, tuina manipulations have shown its unique advantages for its safety, effectiveness, fewer side effects, lower cost, and good compliance. Tuina manipulations can balance yin and yang, unblock meridians and collaterals, and activate the flow of qi and blood, which are equivalent to the effects produced by acupuncture and Chinese medication, and thus regulate Zang-fu organs, adjust tendons and bones, and strengthen the body constitution.

According to modern research, it is through specific methods that the manipulations are performed by physician's hands or other body parts to transform mechanical force to therapeutic energy, which penetrates into the treated area and exerts efficacy via activating the human bio-information system^[3]. Therefore, the potential principle existing in tuina manipulations are worth sorting and exploration, for better inheriting and carrying forward this traditional therapy. By rigorous search of the three major Chinese databases, i.e. Wanfang Academic Journal Full-text Database (Wanfang), Chongqing VIP Database (CQVIP) and China National Knowledge Infrastructure (CNKI), the collected literatures were screened by unified inclusion and exclusion criteria. The acquired data were then extracted and the quality of the studies was evaluated. The possible principle existing in tuina manipulations in the treatment of LIDH were finally analyzed via statistical methods. This research aims to obtain the principle in tuina treatment of LIDH and provide guidance and reference for clinical application.

1 Materials and Methods

1.1 Material source

The clinical studies that adopted tuina manipulations of TCM to treat LIDH were retrieved from Wanfang, CQVIP and CNKI (human patients as the subject, tuina manipulations as the major intervention method, and clinical efficacy as the primary observation item); the

literatures were published between January 1987 and December 2017; the papers were published in journals.

1.2 Retrieve method

Professionals from the library of Yunnan University of Chinese Medicine were commissioned to complete literature retrieval by 1 February 2018.

1.2.1 Retrieval strategy

The strategy was designed as 'lumbar intervertebral disc herniation' AND 'Chinese medicine' OR 'tuina' OR 'manipulation' OR 'Anmo' OR 'bone-setting' OR 'chiropractic' OR 'tendon-adjusting', and the publication period was also set accordingly.

1.2.2 Inclusion criteria

Tuina manipulation was taken as the main intervention method, while other methods were allowed if taken as adjunct intervention (medication, acupuncture-moxibustion, physical therapy, etc.); human as the study subject; clinical trials; the study design should be reasonable and a control group was required; the diagnostic and efficacy evaluation criteria should be universally recognized either on a domestic or a global scale; the operations of tuina manipulations were clearly described in details.

1.2.3 Exclusion criteria

Single case study, reviews, comments, systematic reviews and mechanism exploration studies; clinical trials not taking tuina manipulation as the main intervention method; animal-based studies; study method, diagnostic criteria or efficacy evaluation standard were not well recognized; tuina manipulation terms were untold and the operations were unclear; the study result showed invalid or statistically insignificant.

1.2.4 Data extraction and literature quality evaluation

Three senior retrieval professionals independently included the eligible literatures by reading titles, abstracts and full texts^[4]. They then cross-checked the involved studies, during which, any disagreements would be addressed through discussion or with the help of the corresponding author.

1.2.5 Analysis and statistical method

The terms of tuina manipulations were standardized according to the *Science of Tuina Manipulations*^[5]. The manipulations occurred in the eligible literatures were indexed via Excel and their frequencies were calculated. SPSS version 21.0 was used to statistically analyze the top 20 most frequently used tuina manipulations, by taking manipulations as the only variable with identifiable quantity and their frequencies as a variable to reflect the category feature. Hierarchical cluster, a form of systematic cluster analysis, was applied to the above data, with Q-type, square Euclidean distance and within-group linkage adopted. Agglomeration schedule was used to generate the tree diagrams to demonstrate all clusters.

2 Results

2.1 Literature retrieval and quality evaluation results

A total of 3 704 studies were initially collected from the three databases, 1 089 from CQVIP, 1 614 from

Wanfang and 1 001 from CNKI. After 2 444 duplicates and 1 927 ineligible studies were excluded, 517 studies were finally included. The screening process is shown in Figure 1.

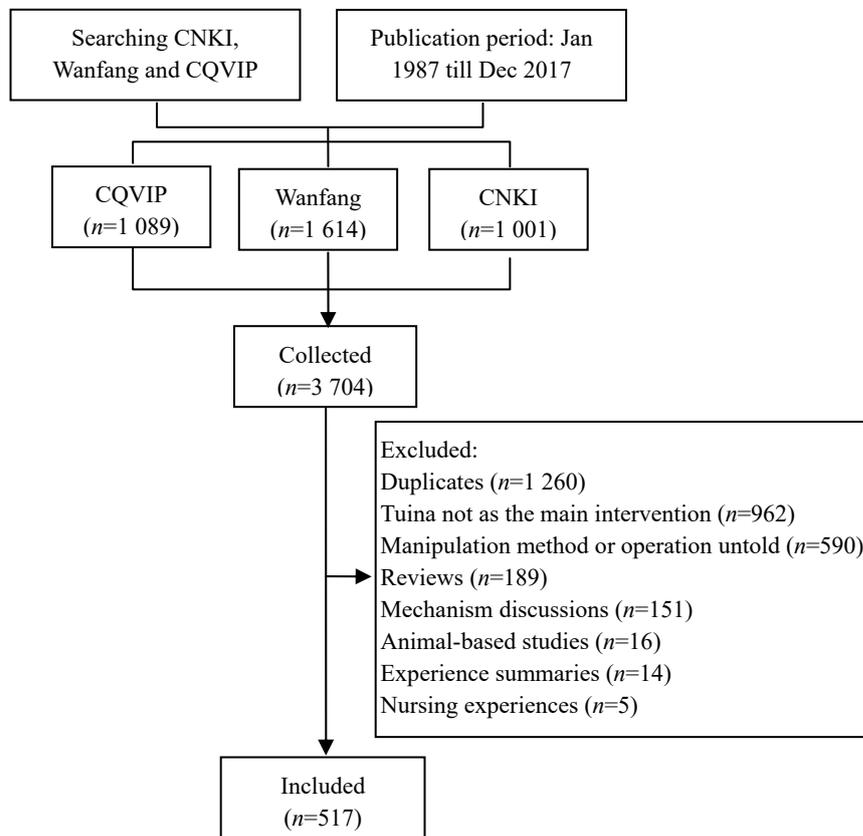


Figure 1. Literature screening process

2.2 Tuina manipulation frequencies

The 517 included studies together contributed 65 tuina manipulations, with a total frequency of 2 477. The frequencies of the top 20 most frequently used manipulations are shown in Table 1. According to Table 1, over 50% of the studies used Gun-rolling and Rou-kneading methods, indicating the swinging manipulations were predominant in clinical application; most of the top 10 manipulations were those applied to soft tissues.

2.3 Hierarchical cluster analysis of tuina manipulations

If clustered in two categories, Gun-rolling, Rou-kneading, Dian-digital pressing, oblique Ban-pulling and An-pressing were taken as the first category and the rest were taken as the second one. When clustered in three categories, Gun-rolling, Rou-kneading, Dian-digital pressing, oblique Ban-pulling and An-pressing were considered as the first category, Tanbo-plucking, Bashen-pulling and extending, horizontal Tui-pushing,

Na-grasping and Anrou-pressing and kneading were considered as the second category, and the rest were taken as the third category. If clustered in five categories, Gun-rolling and Rou-kneading were classified into the first category, Dian-digital pressing, oblique Ban-pulling and An-pressing were taken as the second category, Tanbo-plucking was taken as the third category, Bashen-pulling and extending, horizontal Tui-pushing, Na-grasping and Anrou-pressing and kneading were considered as the fourth category, and the rest were classified into the fifth category. Manipulations with similar rank in frequency showed stronger association. The details are shown in Figure 2. The cluster analysis showed that the tuina manipulations for LIDH were predominated by relaxing manipulations that work on large body areas, assisted by those with concentrated stimulation that work on small body areas, while the large-amplitude joint-moving manipulations were rare.

Table 1. Top 20 tuina manipulations for LIDH

Order	Manipulation	Frequency	Percentage (%)
1	Gun-rolling	313	60.54
2	Rou-kneading	284	54.93
3	Dian-digital pressing	250	48.36
4	Oblique Ban-pulling	240	46.42
5	An-pressing	226	43.71
6	Tanbo-plucking	162	31.33
7	Bashen-pulling and extending	115	22.24
8	Horizontal Tui-pushing	104	20.12
9	Na-grasping	99	19.15
10	Anrou-pressing and kneading	96	18.57
11	Dou-shaking	68	13.15
12	Yao-rocking	57	11.03
13	Ca-scrubbing	56	10.83
14	Pai-patting	47	9.09
15	Post-extension Ban-pulling	42	8.12
16	Mo-rubbing	33	6.38
17	Zhen-vibrating	27	5.22
18	Nie-pinching	26	5.03
19	Fist-back Ji-tapping	24	4.64
20	Dorsal Shen-extending	21	4.06

3 Discussion

3.1 Cluster analysis

Cluster analysis is a statistical method to classify individual samples or index variables based on their characteristics. It can be used to study the category of a new subject^[6], but it is different from classification analysis. The basic principle of cluster analysis is to group things together that share similar mathematic or physical features, and differentiate those with significantly different properties. Tree diagram in a cluster analysis can manifest the distance between two merged items during clustering and the level of an item or variable when classified into a category. Therefore, a tree diagram can be used to track the clustering process. Since two closer items would be merged together first, so the clustering process can clearly reflect which observation items are closer to each other. Therefore, hierarchical cluster analysis was adopted to analyze and discover the possible application principle of tuina manipulations for LIDH which are guided by TCM syndrome differentiation theory.

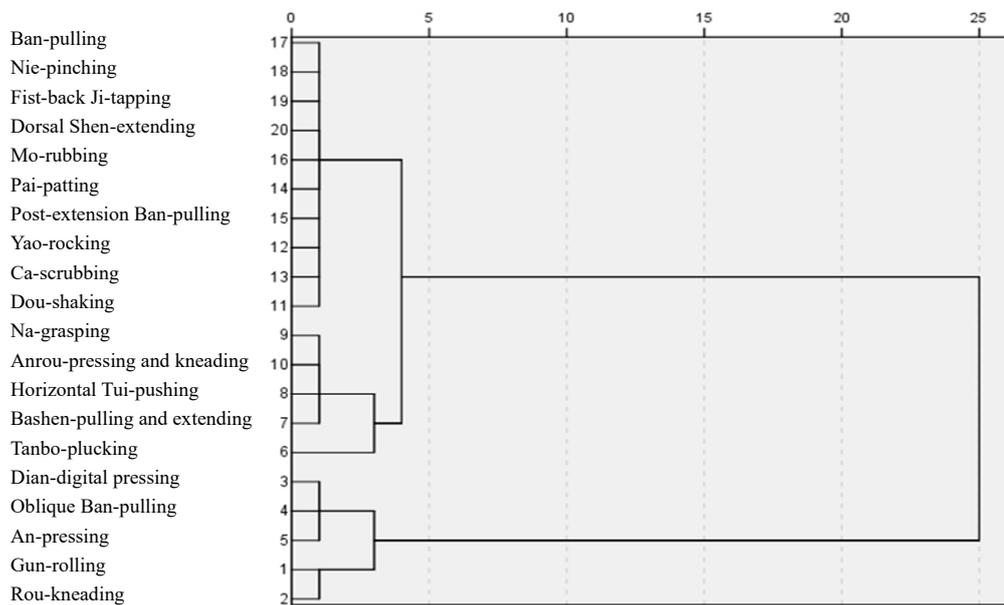


Figure 2. Hierarchical cluster analysis

Note: The longitudinal ordinate shows the rank of tuina manipulations, and the horizontal ordinate indicates the number of samples

3.2 Discussion of the application principle of tuina manipulations for LIDH

3.2.1 Manipulations working on soft tissues

The manipulations working on soft tissues were predominated by swinging manipulations, and Gun-

rolling and Rou-kneading methods ranked the top one and second, respectively. Gun-rolling manipulation is a representative of the Gun-rolling manipulation school. This manipulation is featured by large attaching area, high pressure, mild stimulation and high permeability.

When practicing this manipulation, one should perform forward three times with one time back ward, together with appropriate force^[5]. This manipulation is usually applied to where rich in muscles, working to relax tendons and unblock meridians, and activate blood flow to remove stasis, thereby relieving muscle fatigue. Xu SX, *et al*^[7] established a viscous flow model to observe the effect of Gun-rolling manipulation on hemodynamics, finding that it can affect blood flow. Swinging manipulations working on back and lower limbs can mitigate spasm and improve blood circulation^[8].

Fixing is the premise of Rou-kneading manipulation, which induces 'internal friction' by 'static friction' between the hand and the treated area, so as to unblock adhesion, promote circulation and boost the absorption of inflammatory factors^[9], for better releasing muscle fatigue^[10].

The squeezing-pressing manipulations were taken as the adjunct method: Dian-digital pressing, An-pressing, Tanbo-plucking, horizontal Tui-pushing, Na-grasping, Anrou-pressing and kneading and Nie-pinching manipulations ranked the third, fifth, sixth, eighth, ninth, tenth and eighteenth, respectively.

Dian-digital pressing manipulation originates from An-pressing but is different from An-pressing manipulation. Dian-digital pressing is heavier, working to unblock meridians and collaterals, open orifices, release convulsion to stop pain, increase pain threshold, and mitigate pain, numbness and weakness in LIDH by changing the location relation between the herniated nucleus pulposus and the compressed nerve^[11].

The key in An-pressing manipulation is pressing and retaining. While working on a relatively smaller area, this manipulation acts deeply and heavily with a fixed and perpendicular force^[12]. It can dredge meridians and collaterals, soothe and cease pain, release spasm and remove stasis. It is often applied to treat pain symptoms due to its satisfactory analgesic effect^[13]. The analgesic action may be achieved by externally relieving lumbar muscle spasm and internally correcting joint disorders, changing the relation between nerve root and the surrounding tissues, especially the relation between herniated disc and the thecal sac, mitigating the compressed nerve root, and reducing inflammatory swelling and its stimulation to nerve root^[14].

Tanbo-plucking originated from Anrou-pressing and kneading. This manipulation can unblock collaterals to cease pain, resolve adhesion, improve blood circulation in lumbar muscles and the tissues around, accelerate the absorption of metabolites and inflammatory substances, and encourage the repair of lesions, subsequently soothing muscular fatigue^[15-16].

The essential point when practicing horizontal Tui-pushing manipulation is single direction in a straight

line, with moderate force and closely attaching to the body surface. With mild and stable stimulation, this method can dredge meridians and collaterals, activate blood flow and ease pain, regulate tendons and eradicate nodules, boost lymph flow and blood circulation in lower back, release muscle spasm, sedate and release pain, as that it can produce significant efficacy for pain and numbness in sciatic nerve-distributed areas caused by LIDH^[17].

Na-grasping manipulation uses an opposing force and contains three moves, i.e. pinching, lifting and kneading, in which, pinching is the fundamental and lifting and kneading are the assistant. The performance should be dexterous, with strong stimulation and stable force. Na-grasping the lower-limb muscles and painful nodules can promote qi and blood flow and unblock meridians and collaterals in order to ease pain and numbness, muscle tension and spasm^[18].

Anrou-pressing and kneading is the combination of Anrou-pressing and kneading manipulations. Thus, it possesses the penetration feature of An-pressing and the tenderness feature of Rou-kneading, forceful and tender at the same time. Anrou-pressing and kneading on the back and lower-limbs can up-regulate the level of endorphin, play a calming and analgesic role, and reduce the lumbago and the pain where the sciatic nerve distributes^[19].

Nie-pinching can produce a direct stimulation. LIDH patients often experience numbness, pain, cold sensation and hypoesthesia in the lower limbs. This tuina manipulation can unblock collaterals, activate blood flow, promote qi movement, cease pain, and boost the microcirculation to improve the symptoms.

Other manipulations that work on soft tissues included Dou-shaking, Ca-scrubbing, Pai-patting, Mo-rubbing, Zhen-vibrating, fist-back Ji-tapping manipulations, which ranked the 11th, 13th, 14th, 16th, 17th and 19th, respectively.

Dou-shaking manipulation requires an even constant force with a small-amplitude. This method can unblock meridians and collaterals, smooth joints, activate qi and blood flow, release spasm, reduce muscle tension, improve muscle strain, and correct lumbar facet joint disorder and synovial incarceration. What's more, it can also enlarge the posterior lumbar interspace, which is helpful for the herniated substance to go back, to lessen pain in the low back and leg^[20-21].

Ca-scrubbing is a major form in Neigong Tuina school. It requires a moderate force, a generally low speed, a straight route back and forth, and stable successive moves. This manipulation is featured by concentrated permeating heat which makes the internal hot despite the warm or non-warm surface^[22]. Ca-scrubbing can warm and unblock meridians to unblock collaterals,

dispel wind and cold, resolve stasis to cease pain, and activate qi and blood flow. Thus, it can reduce muscle tension, promote local blood circulation and the absorption of inflammation and swelling, lessen the low back pain and lower-limb numbness^[23].

Pai-patting manipulation transmits mechanical force to induce vibration of the treated area. This method can relax tendons and unblock collaterals, boost qi and blood flow, release muscle spasm, reduce inflammation, increase the topical blood flow and accelerate metabolism, thereby relieve spasm and pain, and regulate the function of Zang-fu organs^[24].

Mo-rubbing manipulation produces heat via rubbing the body surface and the heat can penetrate inside through skin and subcutaneous tissues, to enhance the dilation of lumbar capillaries and boost circulation^[25]. This method works to dispel cold and stasis, unblock collaterals to stop pain, lessen inflammation, and improve lumbar muscle tension, spasm and pain.

Zhen-vibrating manipulation finds its first record in *Zhu Bing Yuan Hou Lun (Treatise on the Origins and Manifestations of Various Diseases)*. It is a manipulation inducing vibrating moves via rhythmic contraction of forearm muscles. This manipulation can boost blood flow, unblock nodules, regulate qi movement to resolve stagnation^[26-27]. Therefore, it works to improve lumbar muscle tension and spasm, as well as lower-limb numbness and pain.

With a strong instant force, fist-back Ji-tapping acts on the back region to unblock stasis and collaterals and activate yang qi, so that it can help with lumbar pain, as well as the numbness and decreased sensation in lower limbs.

3.2.2 Manipulations working on bones and joints

Manipulations working on bones and joints are predominated by pulling manipulations. Oblique Ban-pulling and post-extension Ban-pulling ranked the fourth and 15th, respectively. Oblique Ban-pulling can balance yin and yang, regulate qi and blood in Zang-fu organs, relax tendons, soothe meridians and reset bones. Seeking the trigger points when lumbar muscles are in relaxation and controlling the application point with the bending and rotation of the spine^[28], oblique Ban-pulling manipulation corrects the displaced tendons and bones by an instant controllable force. Hence, this method can loosen the adjacent articular processes, enlarge the intervertebral space and lateral recess, and reduce the pressure to intervertebral disc, thereby lessening the compression and stimulation of the herniation to nerve root and dural sac and finally treat LIDH^[29]. Post-extension Ban-pulling is a back extension manipulation performed based on the coronal axis of the lumbar spine within normal physical

range of motion. It can correct the lumbar joint disorder, enlarge intervertebral space, decrease the pressure to intervertebral discs, help to restore the herniated disc, change the spatial relation between nerve root and the herniated disc, adjust the spinal line of force, and reduce the compression to nerve root, so as to improve low back pain, as well as numb and cold sensation of the lower limbs^[30-32].

The type of Bashen-pulling and extending manipulations has been basically taken as the assistant. Bashen-pulling and extending and dorsal Shen-extending manipulations ranked the 7th and 20th, respectively. This type of manipulations should be performed stably, gently, gradually increase in force, pause for a while, and then slowly turn back. Bashen-pulling and extending applied to lumbar spine can increase the spaces between vertebral bodies and between the adjacent articular processes, restore the facet joints, reduce the pressure to spine, and loosen adhesions, thus producing satisfactory efficacy for L₅/S₁ LIDH of lateral type, soothing the lower-limb numbness, weakness and pain caused by nerve compression^[33-34]. Dorsal Shen-extending can make large the intervertebral space, restore the right location of the facet joints, and then mitigate the tension and spasm of lumbar soft tissues.

Yao-rocking ranked the 12th amongst the manipulations working on bones and joints. It exerts force in an coherent way and makes use of the weight of the patient to sway the lumbar region^[35], keeping lumbar muscles throughout repeated relaxation and contraction states, which can decompress the internal tissues and boost blood circulation, loosen adhesions, promote the eradication of inflammatory and necrotic tissues, and balance the lumbar muscle force and the internal-external mechanics of the spine^[36].

3.3 Principle under TCM tuina manipulations for LIDH

The top 20 most frequently used manipulations for LIDH can be classified into two categories, i.e., those working on soft tissues and those applied to bones and joints, and the former was predominant while the latter was as the assistant. Regarding the feature of using force, the manipulations that work on soft tissues were majorly swaying type, assisted by the squeezing-pressing type; those that work on bones and joints were mainly Ban-pulling type, aided by the Bashen-pulling and extending type.

To sum up, the tuina manipulations used for LIDH are mainly those working on soft tissues, followed by those for bone-setting. The combination of the two types of manipulations is beneficial to achieving the most significant efficacy^[37-41].

Conflict of Interest

There was no potential conflict of interest in this article.

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