

Original Article

Efficacy comparison of acupuncture and balanced acupuncture combined with TongduZhengji manipulation in the treatment of acute lumbar sprain

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Abstract: Objective: To compare the curative effect of balanced acupuncture combined with TongduZhengji manipulation vs acupuncture in the treatment of acute lumbar sprain. Methods: Clinical data of 71 patients with acute lumbar sprains in our hospital from January 2020 to December 2020 were retrospectively analyzed. Patients were divided into single group (n=35) and combined group (n=36) based on treatment methods. The single group received only acupuncture treatment, while the combined group received balanced acupuncture combined with TongduZhengji manipulation. The treatment efficacy, pain level, lumbar function and motion of the lumbar spine were compared between the two groups. Results: The Visual Analogue Scale (VAS) scores of the combined group were lower than those of the single group after 3, 4, and 5 days of treatment (P<0.05). There was no significant difference in VAS scores between the two groups after 1 and 2 days of treatment (P>0.05). The Roland-Morris Disability Questionnaire (RMDQ) score of the combined group showed no significant difference compared with that of the single group after 1 and 2 days of treatment (P>0.05), and were lower than those of the single group after 3, 4, and 5 days of treatment (P<0.05). The Japanese Orthopedic Association (JOA) score of the combined group after 1, 2, and 3 days of treatment showed no significant difference compared with the single group (P>0.05), and was higher than that of the single group after 4 and 5 days of treatment (P<0.05). The Range of Motion (ROM) score of the combined group showed no significant difference compared with the single group after 1 and 2 days of treatment (P>0.05), and was lower than that of the single group after 3, 4, and 5 days of treatment (P<0.05). The total effective rate of treatment in the combined group was significantly higher than that in the single group (91.67% vs. 71.43%) (P<0.05). Conclusion: Compared with acupuncture alone, balanced acupuncture combined with TongduZhengji manipulation can significantly reduce the pain level and improve lumbar spine mobility as well as lumbar spine function, exhibiting better curative effect than acupuncture only.

Keywords: Balanced acupuncture, TongduZhengji manipulation, acute lumbar sprain, treatment, curative effect

Introduction

In the Department of Orthopedics, the incidence of acute lumbar sprain is high, mostly caused by improper external force, resulting in acute injury of joints and soft tissues, severe lumbar pain, lumbar spine dysfunction, and thus affects the quality of life. Acute lumbar sprain has a short course. Without timely effective treatment, the lower back pain will be difficult to heal or further aggravated, resulting in chronic low back pain.

Western medicine treatment of acute lumbar sprains includes oral medications and steroid injections for pain relief. Oral medications can quickly relieve pain, but are not effective in

relieving local muscle spasms and tension. Long-term administration also has an adverse effect on digestive function [1]. Steroid injections can slightly improve the motion in the affected area, but the analgesic effect is unsatisfactory and cannot assist in repairing the damaged tissue [2]. With the deepening of research, traditional Chinese medicine has been extensively applied in orthopedics, and its application value has also been widely confirmed. Balanced acupuncture is a new type of acupuncture based on traditional medicine and modern theories. Balanced acupuncture is a holistic medical regulation model that adapts to psychology, physiology, society and nature. It makes full use of the information system of human body (i.e. nerve, meridian and body fluid

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system) and the feedback effect principle of acupuncture technique, and takes acupuncture as a means to select a specific point on the healthy side of the human body to stimulate and mobilize the patient's own defense system to achieve self-healing, self-improvement and self-regulation. Unlike conventional acupuncture which mainly selects acupoints based on the mechanism of acupoint action, balanced acupuncture emphasizes the body's own balance system to re-adjust the subtle energy, thus achieving the desired efficacy [3].

TongduZhengji manipulation is a technique guided by Chinese medicine theory in terms of anatomy, biomechanics and rehabilitation medicine. The method is based on the functional correlation of the spine, meridians and viscera, emphasizing spine restoration and abdominal conditioning [4]. TongduZhengji manipulation can exert a good effect of promoting blood circulation, removing blood stasis, and relieving spasms and pain in the treatment of acute lumbar sprain. Continuous intervention can effectively relieve symptoms, restore the patient's waist function and improve the quality of life.

In previous studies focusing on acute lumbar sprain, the balanced acupuncture and TongduZhengji manipulation were used separately. There are few studies on the combination of the two treatments. This study retrospectively analyzed the clinical data of 71 patients with acute lumbar sprains admitted to the Orthopedic Department of our hospital, and compared the therapeutic value of balanced acupuncture and TongduZhengji manipulation vs acupuncture alone to explore more effective options.

Materials and methods

Clinical data

The clinical data of 71 patients with acute lumbar sprains in our hospital from January 2020 to December 2020 were retrospectively analyzed. Patients were divided into single group (n=35) and combined group (n=36) based on treatment methods. The single group received only acupuncture treatment, and the combined group received balanced acupuncture combined with TongduZhengji manipulation. This study has been approved by the Ethics Committee of Binzhou Medical University Hospital (approval number NCT02546328).

Inclusion criteria: (1) patients who met the diagnostic criteria for acute lumbar sprains in the "Clinical Diagnosis and Treatment Guidelines Orthopedics Fascicle" compiled by the Chinese Medical Association as well as the diagnostic criteria for acute lumbar sprains in the "Diagnosis and Curative Effect Criteria for Diseases and Symptoms in Traditional Chinese Medicine" promulgated by the State Administration of Traditional Chinese Medicine; (2) patients who were diagnosed with lumbar sprain by X-ray machine; (3) patients whose course of the disease did not exceed 3 days; (4) patients aged 18-80 years; (5) patients who completed all treatments and follow-ups as expected; (6) patients with good compliance, and were highly informed of the research content and signed the consent form.

Exclusion criteria: (1) patients with chronic low back pain who had received spinal surgery; (2) patients combined with coagulation dysfunction; (3) patients with audiovisual and speech disorder; (4) patients with mental illness; (5) patients combined with tuberculosis or malignant tumor; (6) patients with pathologies that may cause low back pain such as lumbar spinal stenosis, lumbar herniated disc or spine fracture; (7) patients combined with serious diseases of vital organs, such as heart, liver, lung and kidney.

Methods

The single group received conventional acupuncture using Huatuo acupuncture needles (40 mm*10, Suzhou Medical Appliance Factory, Suzhou, China) (**Figure 1A**). The patient was instructed to lie face down, and keep the back of the hands facing up. According to the standards in "Acupoint Names and Positioning", acupuncture was performed at four Yaotong acupoints on the affected side (**Figure 1B**), including the back of the hand, acupoint between the 2nd, 3rd and 4th and 5th metacarpal bones, two acupoints at the midpoint of the wrist stripes and metacarpophalangeal joints. The acupoints were disinfected with 75% alcohol. Acupuncture needles were guided obliquely to puncture the acupuncture points from both sides to the palm, with a depth of 1.5 cm, for 1-2 min.

The combined group received balanced acupuncture combined with TongduZhengji manipulation. (1) Balanced acupuncture. The middle of the forehead was selected as Yaotong acu-

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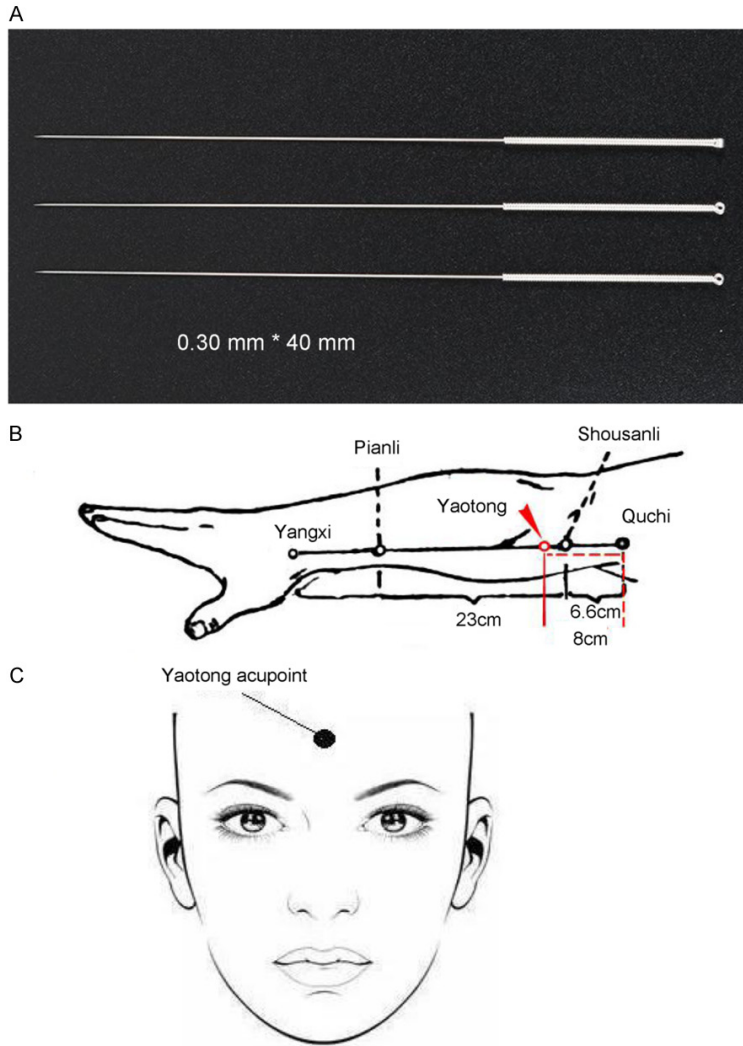


Figure 1. Diagram of Yaotong acupoints in both groups. (A) acupuncture needles, (B) the location of Yaotong acupoints in the single group, (C) the location of Yaotong acupoints in the combined group.

point (**Figure 1C**). The No. 3 filiform needles (6 cm in length) (Suzhou Medical Appliance Factory, Suzhou, China) were used. After routine disinfection, Yaotong acupoints on both sides were punctured with the needle tip facing downward, pushing 2-3 cm along the subcutaneous periosteum. If the patient had low back pain on the right side, the needle tip should be punctured 2-3 cm toward the left, and vice versa. Patients may experience unusual pain during puncture. Meanwhile, the patient was instructed to squat, bend, sit and stand up 2-3 times. The needle was withdrawn when patient was sitting. (2) TongduZhengji manipulation was divided into three steps: relaxing, restoring and abdomen adjustment. Relaxing: the patients stayed in a prone position, and the doc-

tor stood by and massaged spinal muscles, hip muscles, especially in the pain area at both sides with the palms for 8 min. The Yaojiaji, Shenshu, Dachangshu, Guanyuanshu, Baliao, Yanglingquan, Weizhong, Chengshan and Kunlun points were determined and kneaded sequentially with the thumb. Each point was massaged for 20 sec. Then the thumbs of both hands were pressed on the outer edge of the erector spinae muscles, and the erector spinae muscle, the transverse process of the lumbar spine, the upper edge of the iliac crest and the hip muscles were worked from top to bottom, especially at the pain areas. The procedures were repeated 2-3 times. Finally, the Governor Meridian was pushed and massaged on the midline of the back and the bladder meridian on both sides for 4 times by palms. Restoration: the patient was instructed to lay on their left side with the left lower limb straight and the right lower limb bent. The doctor stood beside the patient, withdrew the patient's left upper limb with the left hand, kept the patient's left upper limb perpendicular to the torso, and

held the patient's right wrist with the right hand and kept the patient's right elbow bent. The doctor placed his right elbow against patient's right shoulder joint to move the right shoulder joint back forward. The doctor placed his left elbow on the patient's right hip, and placed his left thumb and middle finger on the patient's 4th lumbar spinous process. The doctor kept both knees slightly bent and the body forward, exerted force on both elbows at the same time, pushed the left and right elbows forward and backward respectively, passively rotated the patient's lumbar spine, applied different forces through the elbows on the patient's spine. Therefore, the misaligned joints were subjected to the pulling force. When the doctor felt resistance under the left hand, he paused for a

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while, instructed the patient to take a deep breath, and at the end of the expiration, exerted a little more pulling force to restore the disordered lumbar spine. Abdomen adjustment: the patients kept laying on their back with hips and knees bent. The doctor stood beside with palms overlapped and placed on the patient's Shenque point. With this point as the center point, the whole abdomen was kneaded clockwise with palms for 36 rotations. Then the doctor tapped Zhongji, Guanyuan, and Qihai of the patient's abdomen with his thumb. The other hand was placed on the back of the hand, and both hands worked in concert to tap the above-mentioned acupuncture points vertically downwards. When the patients were exhaling, the doctor gradually applied a vertical downward pressure to keep the patients' abdomen sinking 3-5 cm, and when inhaling, the force was slowly removed. The procedure was repeated for 1 min. The doctor placed the right and middle fingers on the bilateral Xingshu points, the left palm on the back of the right hand to increase the pressure, and both fingers together evenly and gently pressed down on bilateral Xingshu points. When the doctor felt obvious resistance, they would return to the original position after 10 s. The procedure was repeated 5 times. The treatment was performed daily for 5 days.

Outcome measurements

Baseline data: sex, age, course of disease, and body mass index (BMI) of patients in both groups were collected.

Pain level: The Visual Analogue Score (VAS) [5] was used to evaluate the pain level of the waist on a scale of 0 to 10 points. Zero points meant no pain and 10 points meant severe pain. Higher score indicates more obvious pain. Patients were assessed based on their subjective feelings before treatment and at 1, 2, 3, 4, and 5 days after treatment.

Lumbar spine function: The Roland-Morris Disability Questionnaire (RMDQ) [6] was used to evaluate the degree of lumbar spine dysfunction. The questionnaire contains 24 questions, covering walking, bending, sleeping, dressing, sitting and self-care abilities. A higher score represents more obvious lumbar spine dysfunction. The Japanese Orthopedic Association (JOA) lumbar function score [7] was used to evaluate the lumbar function, covering subjective symptoms (9 points), clinical signs (6 points), limitations in activities of daily living

(14 points) and bladder function (-6 to 0 points, normal is 0 points, slightly restricted -3 points, and obviously restricted -6 points). The scale has a total score of 29 points. Higher score indicates better lumbar function. The evaluation was performed before treatment and at 1, 2, 3, 4, and 5 days after treatment.

Lumbar motion: Range of Motion (ROM) [8] was used to evaluate the lumbar motion of patients on a 5-point Likert scale. Zero points: being able to bend freely while touching the ground with fingers; 1 point: being able to bend over while touching the knees with hands; 2 points: being able to bend over less than 70°; 3 points: being barely able to bend over; 4 points: being unable to bend over; 5 points: not only unable to bend over, but also unable to move. The evaluation was performed before treatment and at 1, 2, 3, 4, and 5 days after treatment.

Therapeutic effect: According to "Diagnosis and Curative Effect Standards of Traditional Chinese Medicine Diseases" [9], the evaluation criteria of curative effect was formulated. Recovery: After 5 days of treatment, the patient's waist pain disappeared, and the spine function returned to normal. Improvement: The patient experienced mild waist pain after 5 days of treatment, and the spine mobility recovered more than 50% but not completely. Ineffective: the patient still had significant waist pain after 5 days of treatment, and the spine mobility recovered less than 50%. Total effective rate = recovery rate + improvement rate.

Statistical methods

SPSS 23.0 was used to analyze all data. Count data were described as [n (%)], and χ^2 test was used for inter-group comparison. Quantitative data were described as (mean \pm standard deviation), and comparisons between two groups were processed by independent sample t test, repeated measurement data (VAS, RMDQ, JOA, ROM) by repeated measure analysis of variance, and post hoc comparison by SNK test. Graphs were plotted by Graphpad Prism 9. $P < 0.05$ was considered statistically significant.

Results

Comparison of baseline data

There was no statistically significant difference in terms of sex, average age, average duration of disease and average BMI between the two groups ($P > 0.05$) (Table 1).

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Table 1. Comparison of general data (mean ± SD)/[n (%)]

General data		Combined group (n=36)	Single group (n=35)	t/χ ²	P
Sex	Male	20 (55.56)	21 (60.00)	0.144	0.705
	Female	16 (44.44)	14 (40.00)		
Age		58.76±21.16	59.18±20.43	0.085	0.933
Course of disease (days)		1.75±0.67	1.70±0.69	0.310	0.758
BMI (kg/m ²)		20.16±1.76	20.21±1.79	0.119	0.906

Note: BMI, body mass index.

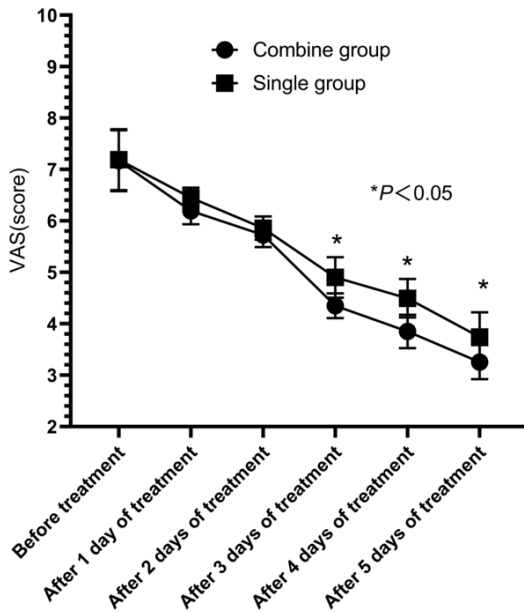


Figure 2. Comparison of pain level between the two groups. Repeated measure analysis of variance was performed, and post hoc comparison was performed by SNK test. *P<0.05 compared with the single group.

Comparison of VAS scores

There was no significant difference in VAS scores between the two groups before treatment ($P>0.05$). At 1-5 days after treatment, the VAS scores of the two groups gradually decreased, exhibiting statistical significance at multiple later time points ($P<0.05$). Compared with the single group, the combined group had a greater reduction in VAS scores. From the 3rd day after treatment, the VAS score of the combined group showed significant difference compared with that of the single group ($P<0.05$). There was a slight difference in the VAS score between the two groups after 1 and 2 days of treatment but without statistical significance ($P>0.05$) (Figure 2).

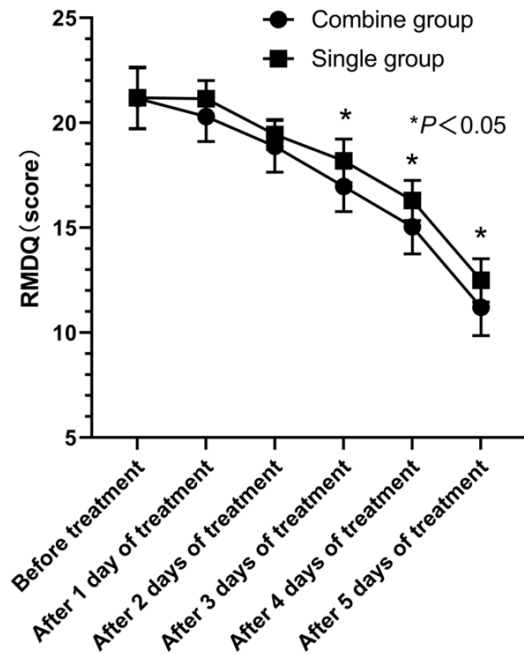


Figure 3. Comparison of RMDQ score between the two groups. Repeated measure analysis of variance was performed, and post hoc comparison was performed by SNK test. *P<0.05 compared with the single group. RMDQ, Roland-Morris Disability Questionnaire.

Comparison of RMDQ scores

There was no significant difference in RMDQ scores between the two groups before treatment ($P>0.05$). At 1-5 days after treatment, the RMDQ scores of the two groups gradually decreased, and there was a significant difference between the two groups at different time points ($P<0.05$). The RMDQ score of the combined group after 1 and 2 days of treatment showed no statistical significance as compared with that of the single group ($P>0.05$), and the RMDQ score exhibited statistical difference between the two groups after 3, 4, and 5 days of treatment ($P<0.05$) (Figure 3).

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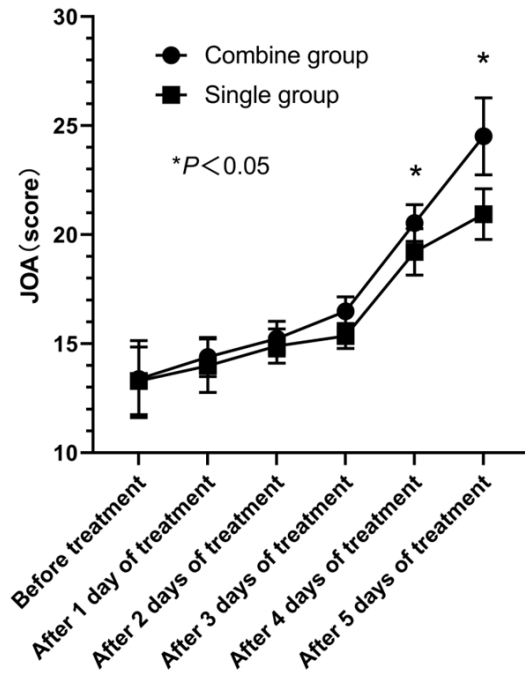


Figure 4. Comparison of JOA score between the two groups. Repeated measure analysis of variance was performed, and post hoc comparison was performed by SNK test. * $P<0.05$ compared with the single group. JOA, Japanese Orthopedic Association.

Comparison of JOA scores

There was no significant difference in JOA scores between the two groups before treatment ($P>0.05$). After 1-5 days of treatment, the JOA scores of the two groups gradually increased ($P<0.05$). The JOA score of the combined group after 1, 2, and 3 days of treatment showed no statistical difference as compared with that of the single group ($P>0.05$). The JOA score of the combined group was significantly higher than that of the single group at 4 and 5 days after treatment ($P<0.05$) (Figure 4).

Comparison of ROM scores

There was no significant difference in ROM scores between the two groups before treatment ($P>0.05$). After 1-5 days of treatment, the ROM scores of the two groups decreased gradually ($P<0.05$). The ROM score of the combined group after 1 and 2 days of treatment exhibited no statistical difference as compared with that of the single group ($P>0.05$). The ROM score of the combined group was significantly lower than that of the single group at 3, 4, and 5 days after treatment ($P<0.05$) (Figures 5 and 6).

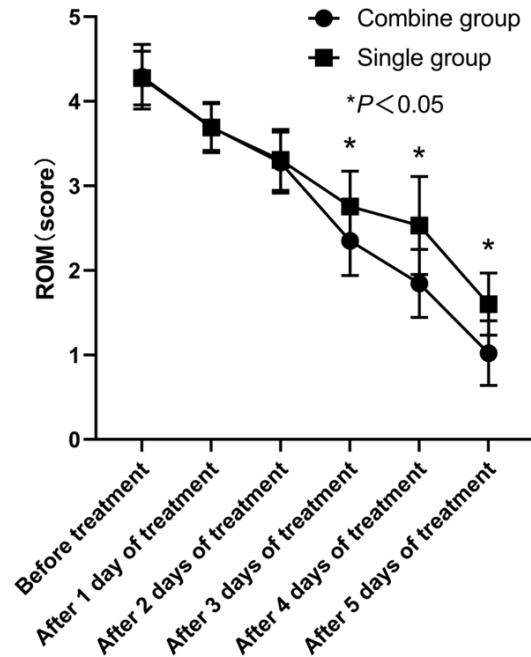


Figure 5. Comparison of ROM score. Repeated measure analysis of variance was performed, and post hoc comparison was performed by SNK test. * $P<0.05$ compared with the single group. ROM, Range of Motion.

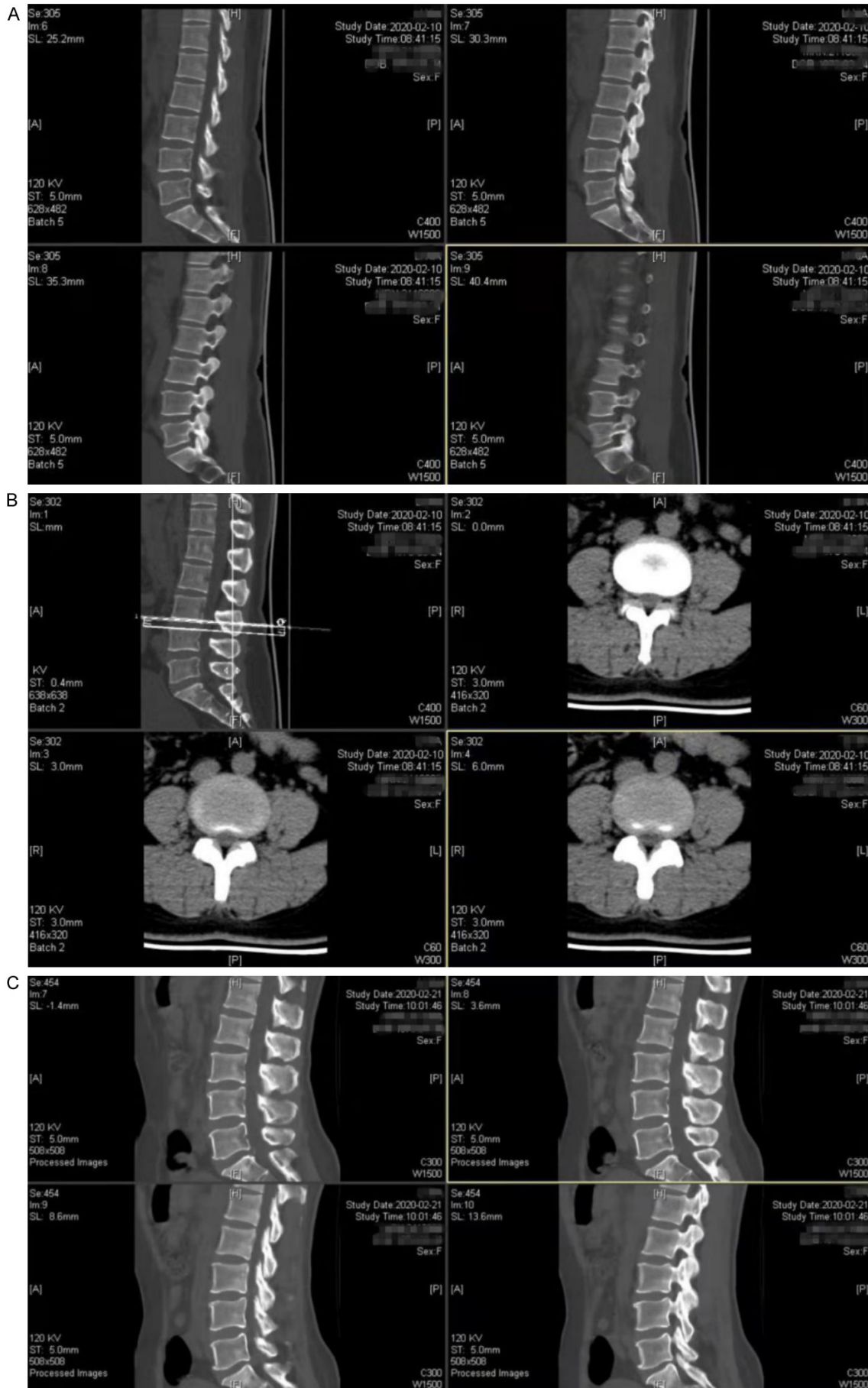
Comparison of the total effective rate of treatment

In the combined group, the conditions of 15 cases were recovered, 18 cases were improved, and 3 cases were ineffective after 5 days of treatment, with a total effective rate of 91.67%. In the single group, the conditions of 10 cases were recovered, 15 cases were improved, and 10 cases were ineffective after 5 days of treatment, with a total effective rate of 71.43%. The total effective rate of the combined group was significantly higher than that of the single group ($P<0.05$) (Table 2).

Discussion

Acute lumbar sprain involves the lumbar fascia, lumbar facet joint, ligaments, lumbosacral joints and muscles, with a history of obvious trauma. The patient experiences persistent severe pain in the waist, which is aggravated when sneezing, coughing and deep breathing. After resting, the patient's pain can be reduced, but cannot be completely eliminated, and the pain can also increase in cold weather [10]. Acute lumbar sprains were categorized as side

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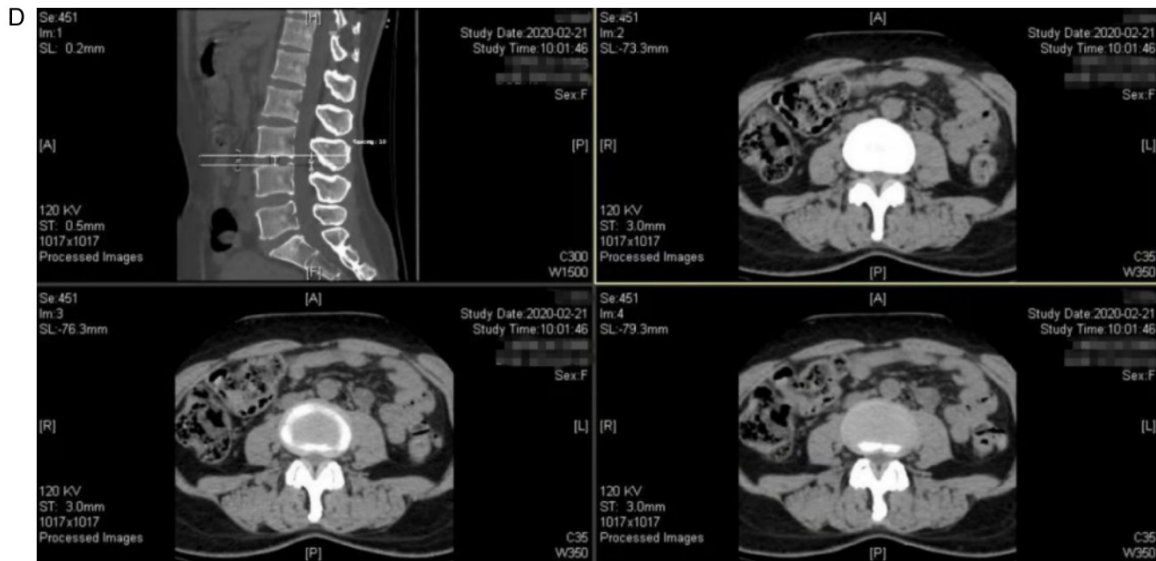


Figure 6. CT images before and after treatment. Compared with before treatment (A, B), lumbar curvature was slightly increased, and L3/4 disc herniation was slightly improved after treatment (C, D).

Table 2. Comparison of the total effective rate after 5 days of treatment (n, %)

Group	Recovery	Improvement	Ineffective	Total effective rate
Combined group (n=36)	15 (41.67)	18 (50.00)	3 (8.33)	33 (91.67)
Single group (n=35)	10 (28.57)	15 (42.86)	10 (28.57)	25 (71.43)
χ^2				4.860
P				0.027

stitch and low back and leg pain by traditional Chinese medicine. It is believed that trauma and overwork lead to damage to the muscles and veins, which makes the body weak, resulting in Qi stagnation and blood stasis, causing numbness, pain and limited mobility [11]. Acute lumbar sprains mostly occur in Governor Meridian as well as Bladder Meridian of Foot-taiyang. Due to sudden onset, the circulation of the meridians is impaired, causing meridian obstruction, stagnation of Qi and blood stasis, leading to dysfunction of Qi and blood, and pain [12]. Therefore, dredging the meridians, promoting Qi and blood circulation are crucial for the treatment of acute lumbar sprain.

The balanced acupuncture therapy in this study highlights the body's own balance, and its essence is to activate the body's self-regulation function. The purpose of acupuncture is to adjust, optimize or even repair the body's balance system to refresh the energy and accelerate the rehabilitation [13]. It has been confirmed that by accepting reasonable stimuli from the outside, the body's balance system

can also be passively strengthened [14]. Balanced acupuncture is thought to be an artificial external stimulus to achieve a balanced state [15]. Bianco [16] used balanced acupuncture to treat acute lumbar sprains, and the results showed that the ROM, VAS score and present pain intensity (PPI) rating after treatment were superior to those of the single treatment group. The treatment of acute lumbar sprain by TongduZhengji manipulation requires three steps. First, relaxation by plucking, palm rolling and kneading is needed in order to dredge the Governor and Bladder Meridians, and promote the harmonization of Qi and blood in the affected area. Second, the misaligned spine vertebral body is determined by palpation, and corrected by repositioning, so that the vertebral body can return to the normal anatomical position, which restores the smooth flow of Qi and blood in the Governor and Bladder Meridians. Finally, the abdomen-regulating technique is adopted to regulate the Ren Meridian by palm kneading, which can replenish Yin and enhance Yang. The three steps are progressive and closely connected, and they

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together promote blood circulation and relieve pain, dredging meridians and collaterals, and relaxing tendons [17, 18]. A study confirmed the effectiveness of cervical spondylosis [19]. Another study has applied TongduZhengji manipulation in the treatment of lumbar intervertebral disc herniation, showing that the serum inflammatory level is more normal, and the overall curative effect is higher [20].

In this study, VAS, RMDQ, and ROM scores of the combined group were lower than the single group after 3, 4, and 5 days of treatment, whereas the JOA score of the combined group was higher than that of the single group after 4 and 5 days of treatment ($P < 0.05$), indicating that compared with acupuncture alone, the balanced acupuncture combined with Tongdu-Zhengji manipulation could more effectively improve pain associated with deformed lumbar sprain and function of the lumbar spine. VAS, RMDQ, ROM scores after 1 and 2 days of treatment, and JOA scores after 1, 2, and 3 days showed no significant difference between the two groups ($P > 0.05$). The difference was not obvious due to the short-term treatment. However, it can be found that the scores of the combined group at 1, 2, and 3 days after treatment were slightly higher than those of the single group, which shows the application value of the combined therapy. The total effective rate of treatment in the combined group was significantly higher than that in the single group (91.67% vs. 71.43%) ($P < 0.05$), suggesting that TongduZhengji manipulation with balanced acupuncture can provide more satisfactory outcomes by eliminating the pain quickly, restoring spinal mobility and helping patients improve their quality of life. Yang et al. [21] found that acupuncture combined with manipulation could treat acute lumbar sprains, with the cure rate exceeding 90%. Nie et al. [22] applied acupuncture combined with manipulation in the treatment of acute lumbar sprains, and the results showed that VAS, RMDQ, ROM scores, and sacrospinalis myoelectric signals were better, resulting obvious reduction in IL-6 and TNF- α levels.

Through balanced acupuncture, a benign stimulus signal was applied to the nerve branch or nerve trunk. The stimulus signal is neither targeted at the pathogen, nor directly acts on tissues and organs of the lesion. Only the instructional information is directly transmitted to the

central nervous system with the best route and the fastest speed [23]. This artificially applied stimulus signal can be quickly transmitted to the brain's central control system, adjust the high-level central command system after receiving the command and mobilize the central transmitters, and the diseased subsystem is regulated by the neural command system to promote the release of a large amount of subtle energy, which can improve the body's immunity and increase the pain threshold, exhibiting a stronger metabolism and anti-inflammatory function [24]. In the treatment of acute lumbar sprain in this study, acupuncture at the Yaotong acupoint along the Governor Meridian could relieve pain rapidly and increase patient compliance for later manipulation [25]. The manipulation focuses on the intervention on the local lesions. In addition to loosening the soft tissues around the waist, it adjusts the misaligned spine vertebral body, combined with the abdomen training technique to obtain a more stable and satisfactory curative effect. It provides analgesic effect and corrects the position of lumbar joints, and helps restore the mechanical balance between the spine and adjacent soft tissues [26]. In this study, the combined use of the two treatments fully embodies the concept of Traditional Chinese Medicine and exerts an obvious synergistic effect and ensures high treatment efficiency.

In summary, the treatment of acute lumbar sprains with balanced acupuncture combined with TongduZhengji manipulation can significantly reduce pain, improve lumbar spine mobility and lumbar spine function, resulting in higher overall curative effect than acupuncture only.

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Disclosure of conflict of interest

None.

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