

Clinical observation of the PulStar multiple impulse device in treatment of acute lumbar strain

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Abstract Objective: To observe the clinical efficacy of the PulStar multiple impulse device on acute lumbar strain. Method: Sixty outpatients presenting at the Jingxi Hospital for the Beijing Military Region with acute lumbar strain between August 2015 and August 2016 were randomly divided into an observation group and a control group, with 30 cases in each group. The control group was treated with acupressure at the injured site by therapists; the observation group was treated using the PulStar multiple impulse device. Both groups received infrared irradiation therapy on their lower back for 20 minutes at a time, once a day for 5 d. Pain scores and clinical efficacy were analysed. Results: The pain score showed no significant difference between groups on the first day of treatment ($P > 0.05$). On the third and fifth days, pain scores in the observation group were significantly lower than those in the control group [(5.5 ± 2.1) vs (6.4 ± 2.8), and (1.1 ± 0.3) vs (2.6 ± 1.5)] ($P < 0.05$). The recovery rate in the observation group was significantly higher than that of the control group [90.0% (27/30) vs 70.0% (21/30)] ($P < 0.05$). Conclusion: PulStar multiple impulse therapy can significantly relieve pain in patients with acute lumbar strain.

Key words acute lumbar strain; PulStar multiple impulse therapy; infrared therapy

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Clinical observation of Pulstar multi-pulse apparatus in treatment of acute lumbar muscle injury

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[Abstract] **Objective** To observe the clinical effect of Pulstar multi-pulse apparatus on acute lumbar muscle injury. **Methods** Sixty patients with acute lumbar muscle injury from August 2015 to August 2016 in Jingxi Hospital of Beijing Military Region were randomly divided into observation group and control group, with 30 cases in each group. The control group was treated with acupoint pressing on injured site by therapists; the observation group was treated by Pulstar multi-pulse therapeutic apparatus. Both groups had infrared irradiation therapy on waist 20 min/time, 1 time/d for 5 d. Pain scores and clinical efficacy were analyzed. **Results** The pain score showed no significant difference between groups at the first day of treatment ($P > 0.05$). At the third and fifth days, pain scores in observation group were significantly lower than those in control group [(5.5 ± 2.1) scores vs (6.4 ± 2.8) scores, (1.1 ± 0.3) scores vs (2.6 ± 1.5) scores] ($P < 0.05$). The cure rate in observation group was significantly higher than that in control group [90.0% (27/30) vs 70.0% (21/30)] (all $P < 0.05$). **Conclusion** Pulstar multi-pulse therapy can significantly relieve pain in patients with acute lumbar muscular injury.

[Key words] Acute lumbar muscle injury; Pulstar multiple pulse therapy; Infrared therapy

Acute lumbar strain is a common form of lower back trauma often caused by bending down to pick up a heavy object with excessive force or suddenly turning the body while bent down, whereby the lumbar muscles contract forcefully and the muscles and fascia are placed under excessive strain, even to the point of tearing, resulting in damage to the ligaments^[1,2]. Should this occur, the patient will immediately feel severe pain in one or both sides of the lower back and experience restricted lumbar movement and in inability to bend their back. In severe cases the patient may even be unable to get out of bed, and deep breathing, coughing and sneezing will all exacerbate the pain^[3]. Acute strain can have a serious impact on the patient's everyday life, and if the damaged tissue is not treated promptly fibrosis may occur, followed by scarring and adhesion. This may result in obstructed blood flow to the muscles, degeneration of the

local tissue and eventually chronic lumbar pain or chronic lumbar strain, which are difficult to treat and may significantly affect the patient's personal and professional life^[4]. The PulStar multiple impulse device is designed to treat pain, joint disorders, restricted joint mobility, muscle spasms and myofascitis in the spine, joints and muscles caused by damage or lesions^[5,6]. This study is an observation of the clinical efficacy of the PulStar multiple impulse device in the treatment of acute lumbar strain, the results of which are presented below.

1. Subjects and methods

1.1 Subjects We selected 60 outpatients presenting at the Surgical Department of the Jingxi Hospital for the Beijing Military Region with acute lumbar strain between August

2015 and August 2016. All patients had a history of sprain immediately followed by lower back pain, inability to exert power in the lumbar region, and persistent pain that is aggravated by movement and does not disappear at rest, or is exacerbated by coughing, talking loudly or exerting the lower back. The symptoms and investigation results all confirmed a diagnosis of acute lumbar strain in accordance with the "Disease diagnosis and treatment efficacy standards for Chinese medicine"^[7], published by the State Administration of Traditional Chinese Medicine in 1994. Patients were excluded if they concomitantly presented with conditions such as bone fractures, tumours or tuberculosis. A random number table was used to divide the patients into an observation group and a control group, with 30 cases in each. In the observation group, there were 12 male patients and 18 female patients, aged 26-48 years with a mean age of (37 ± 5) years; in the control group there were 10 male patients and 20 female patients, aged 31-50 years with a mean age of (34 ± 3) years. There were no statistically significant differences in sex and age between the two groups, and both groups were comparable. The protocol used for this study was approved by the hospital's ethics committee, and all patients signed an informed consent form.

1.2 Treatment methods All patients were laid face-down on the bed. Patients in the control group were given acupressure by a physician at the injured lumbar site, with pressure on each acupoint for 2 minutes. Patients in the observation group received acupoint impulses using a PulStar deep multiple impulse probe for 4 min. Treatment was then administered using the shallow probe for 3 min before switching to sweep mode and performing scraper impulse therapy for 2 min. Treatment modes included myofascial trigger point mode, scrape mode, sweep mode (targeted impulse release or rolling release), and meridian treatment mode (acupoint impulses). The acupoints targeted in both groups, either by acupressure or the impulse device, were the *shenshu*, *sanjiaoshu*, *qihai*, *shu*, *huan*, *tiao*, *zhi*, *bian*, *cheng*, *fu*, *wei*, *zhong*, *cheng*, *shan* and lumbar *ashi* points. Following acupressure or impulse therapy, all patients were given infrared irradiation therapy on their lower back for 20 min once a day. Each course of treatment lasted 5 days, and each patient received a single course of treatment.

1.3 Assessment criteria Efficacy was scored and assessed on days 1, 3 and 5 of treatment.

1.3.1 Pain assessment ① Physician assessment: In accordance with the World Health Organisation's pain classification standards^[8]. Level 0 means there is no pain (score = 0); Level I is characterised as bearable pain with little to no sweating, which does not affect the patient's everyday life or interrupt sleep (score = 1); Level II is characterised by an obvious, instinctive pain response with sweating and shortness of breath, but which is still bearable and does not seriously affect sleep (score = 2); Level III is severe, unbearable lumbar pain that causes the patient to cry out and prevents them from sleeping (score = 3). ② Patient assessment: The patients described the severity of their pain using an 11-point numerical pain rating scale^[9,10] numbered between 0 and 10, where 0 represents no pain, 1-3 is mild

pain, 4-6 is moderate pain and 7-10 is unbearable pain. The patient ticked a number on the scale they believed best matched the pain they felt.

1.3.2 Efficacy standards After one course of treatment, a composite pain score was obtained by adding together the WHO pain classification score and the patient's own score on the 11-point scale. Recovered: complete absence of lumbar pain; Improved: reduction in lumbar pain; Unchanged: no improvement in pain symptoms.

1.4 Statistical analysis The SPSS 18.0 statistics program was used for data processing. Measurement data was expressed as $\bar{x} \pm s$ and an independent samples t-test used to compare data between groups. Count data was compared between groups using a χ^2 test, whilst ranked data was compared using a rank sum test. $P < 0.05$ was used to indicate statistically significant difference.

2. Results

2.1 Comparison of the composite pain score after both groups had undergone a single course of treatment On day 1 of treatment, the composite pain score of the observation group was (12.8 ± 2.4) points compared to (12.8 ± 2.4) points in the control group; any differences were not statistically significant ($P > 0.05$). The composite pain scores of the observation group on days 3 and 5 of treatment were significantly lower than those of the control group [(5.5 ± 2.1) vs (6.4 ± 2.8) and (1.1 ± 0.3) vs (2.6 ± 1.5)] (all $P < 0.05$).

2.2 Inter-group efficacy comparison In the observation group 27 patients recovered (90.0%), 3 improved (10.0%) and 0 were unchanged. In the control group 21 patients recovered (70.0%), 5 improved (16.7%) and 4 were unchanged (13.3%). The recovery rate in the observation group was significantly higher than in the control group ($P < 0.05$).

3. Discussion

Acute lumbar strain is caused when excessive stress due to sudden external force damages the muscles, fascia and ligaments in the lower back, especially when it comes under indirect, unexpected strain^[11,12]. As soon as the lumbar muscles are injured, the patient will experience stiffness in the lower back, difficulty bending down or twisting the waist, and worsening and diffuse pain, all of which may seriously affect their personal and professional life. Conventional treatments for acute lumbar strain are massage and infrared therapy, but compliance during these is poor and the process exacerbates pain felt by the patient^[13-16].

In this study, we treated acute lumbar strain with the PulStar multiple impulse treatment device in combination with infrared therapy, precisely targeting and effectively alleviating pain. There was a significant reduction in lumbar pain after one course of treatment, and the pain ultimately disappeared altogether. When the patients underwent a physical examination, 27 no longer experienced any noticeable back pain and had regained full mobility, whereas the other 3 still experienced pain but it did not affect their everyday lives. There were no statistically significant differences between the groups after day 1 of treatment ($P > 0.05$), but there was a significant improvement in the

treatment group on days 3 and 5. The percentage of recovered patients in the observation group was significantly higher than in the control group ($P < 0.05$).

The PulStar multiple impulse device is a medical system developed by the US company Sense Technology. It is predominantly used to treat musculoskeletal pain caused by damage or degeneration of the spine, joints or muscles, and its primary indications include cervical spondylosis, lumbar pain, frozen shoulder, soft tissue damage, lumbar disc herniation, osteoarthritis, joint disorder, limited joint mobility, and migraine. Studies conducted abroad have shown that the device is effective at alleviating pain^[17]. The PulStar multiple pulse device works on the theory of mechanical equilibrium and principle of minimum energy. When objects maintain their normal mechanical equilibrium, their internal energy is at its lowest point, i.e. mechanical equilibrium is equivalent to minimum energy. In the human body, the spinal system is a complex physiological system formed of interconnected vertebrae, muscles, ligaments and fluids, which also conforms with the theory of mechanical equilibrium or minimum energy. This means that any muscle spasms or stiffness near the spinal cord may impact the whole spine and disrupt its previous state of mechanical equilibrium, resulting in a new abnormal equilibrium. The PulStar multiple impulse device works by eliminating muscle spasms, inflammation, joint disorders, scar tissue and other obstacles, so the spinal system can gradually revert to its original optimum location and minimum energy. The result for the patient is relief of their musculoskeletal pain symptoms.

This study demonstrates that using the PulStar multiple impulse device in the treatment of acute lumbar strain yields faster and more marked results than conventional treatment, is painless for the patient, and offers safer diagnosis and treatment, shorter treatment times, and greater comfort.

Conflicts of interest: none

Bibliography

- Liu JY, Liu HY, Zhou GY, et al. Clinical study of acupuncture at the points of the rabbit and the supporting points in treatment of acute lumbar sprain [J]. Journal of Hebei Traditional Chinese Medicine and Pharmacology, 2015, 30(1): 47-49.
- Zhang GM. Comparison on clinical effects of massage and massage combined with fixed point oblique pulling method in the treatment of acute lumbar sprain [J]. Psychological Doctor, 2015, 21(15): 120-121.
- Wu SF, Mo G. Acupuncture treatment and care of acute psoas injury [J]. Chinese Clinical Nursing, 2010, 2(1): 24-25. DOI: 10.3969/j.issn.1674-3768.2010.01.012.
- Li B, Chai H, Du YH. Study on the treatment of acute lumbar sprain by acupuncture at distal acupoints [J]. Shaanxi Journal of Traditional Chinese Medicine, 2009, 30(5): 590-591. DOI: 10.3969/j.issn.1000-7369.2009.05.063
- Reed W, Pickar J. Effects of Instrument-Assisted Spinal Manipulation on Lumbar Muscle Spindle Response in an Animal Model [J]. J Altern Complement Med, 2014, 20(5): A28.
- Leach RA, Parker PL, Veal PS. PulStar differential compliance spinal instrument: a randomized interexaminer and intraexaminer reliability study [J]. J Manipulative Physiol Ther, 2003, 26(8): 493-501.
- State Administration Traditional Chinese Medicine of the People's Republic of China. Diagnostic criteria of traditional Chinese medicine symptoms [S]. Nanjing: Nanjing University Press, 1994: 201.
- Drew D, Gordon D, Renner L, et al. The use of "as-needed" range orders for opioid analgesics in the management of pain: a consensus statement of the American Society of Pain Management Nurses and the American Pain Society [J]. Pain Manag Nurs, 2014, 15(2): 551-554. DOI: 10.1016/j.pmn.2014.03.001.
- Rawal N. Analgesia for day-case surgery [J]. Br J Anaesth, 2001(87): 173-187.
- Huskisson EC. Measurement of pain [J]. Lancet, 1974(2): 1127-1131.
- Hides JA, Stokes MJ, Saide M, et al. Evidence of lumbar multifidus muscle wasting ipsilateral to symptoms in patients with acute/subacute low back pain [J]. Spine, 1994, 19(2): 165-172.
- Hides JA, Richardson CA, Jull GA. Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain [J]. Spine, 1996, 21(23): 2763-2769.
- Bao ZA. Infrared vacuum tank and the traditional cupping therapy compared 418 cases of acute waist injury [J]. Chinese Acupuncture & Moxibustion, 1994(S1): 315-316. DOI: 10.13703/j.0255-2930.1994.s1.348.
- Hu K, Wen ZH. Massage Achilles tendon in treatment of 20 cases of lumbar strain [J]. Nei Mongol Journal of Traditional Chinese Medicine, 1993, 12(3): 32. DOI: 10.16040/j.cnki.cn15-1101.1993.03.030.
- Han MJ, Cheng M. Treatment of acute lumbar strain by acupuncture combined with kneading [J]. Science & Technology Information, 2012(8): 236. DOI: 10.3969/j.issn.1672-3791.2012.08.191.
- Yu B, Yu YZ. 80 cases of acute lumbar sprain treated by acupuncture combined with exercise acupuncture [J]. Chinese Acupuncture & Moxibustion, 2014, 34(10): 983.
- Evans JM. The use of survival analysis for the evaluation of musculo-skeletal therapy [J]. J Manipulative Physiol Ther, 2005, 28(5): 374.

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