Indonesian Journal of Acupuncture
ISSN 3025-8405

Article

Effect of Combined Local-Point Electroacupuncture and Auricular Acupuncture Therapy on Pain Scale and Straight Leg Raise (SLR) Changes in Farmers with Radiating Low Back Pain at the Healthy Family Independent Acupuncture Practice, Kepahiang, Bengkulu

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SUBMISSION TRACK

Received: May 9, 2025
Final Revision: October 12, 2025
Available Online: October 18, 2025

KEYWORDS

Electroacupuncture, Local-point, Ear Acupuncture, Radiating Low Back Pain, Straight Leg Raise

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ABSTRACT

Low back pain radiating to the legs, or radiculopathy, is a condition that involves multiple nerve roots, resulting in pain as well as motor and sensory disturbances. Electroacupuncture and auricular acupuncture are known to reduce pro-inflammatory cytokines and stimulate the release of serotonin, norepinephrine, and endorphins, thereby accelerating the healing process of radiating low back pain. This study aimed to determine the effect of combined local-point electro-acupuncture and auricular acupuncture therapy on changes in pain scale (NRS) and straight leg raise (SLR) among farmers with radiating low back pain at the Healthy Family Independent Acupuncture Practice, Kepahiang, Bengkulu. A quasi-experimental design with a two-group pre-test–post-test approach was employed, using a purposive sampling technique. The results showed that the combination of electroacupuncture and auricular acupuncture significantly affected changes in pain scale and straight leg raise (SLR) ($p<0.001$). The average reduction in NRS was 3.3, while the average increase in SLR was 33%. In conclusion, combined local-point electroacupuncture and auricular acupuncture therapy significantly improved pain scale and straight leg raise (SLR) outcomes among farmers with radiating low back pain.

I. INTRODUCTION

Low back pain radiating to the legs or radiculopathy is a disease condition that spreads and affects more than one nerve root, resulting in pain and disturbances in motor and sensory function(1). Some of the causes of low back pain that radiate to the legs in general are herniated discs that press on the nerve roots, spondylolisthesis, or misalignment between one vertebra and another, inflammation of the lumbar muscle, and spinal or paraspinal masses that provide a compression effect

that causes low back pain to radiate to the legs [2].

Based on international research data in 2019, the prevalence of low back pain radiating to the legs is estimated at 3%-5% of the world's population, which occurs in both men and women[3,4]. Meanwhile, the annual prevalence of low back pain radiating to the legs for the general population in 2021 ranges from 9.9% to 25%.

In Indonesia, especially in the Bengkulu area, there are several plantations and agricultural commodities. From data from the Department of Food Crops, Horticulture and Plantations (TPHP) of Bengkulu province, the total number of farmers in Bengkulu is 88,331 people[5,6]. According to work-related research, farmers experience pain complaints at a rate of 93.7%. This is attributed to a decrease in muscle strength in the lower back and increased compression on the spinal nerves due to farming activities.

Treatment of low back pain radiating to the legs can be done by various methods, both pharmacological and non-pharmacological. One pharmacological approach is Nonsteroidal anti-inflammatory drugs (NSAIDs). NSAIDs are a group of drugs that have been approved by the Food and Drug Administration (FDA) to be used as anti-inflammatories, analgesics, and even antipyretics. However, the use of NSAIDs has a variety of side effects that affect the body's systems, including the kidneys, cardiovascular system, liver, gastric mucosa, and hematology[7].

One of the non-pharmacological methods that has been proven effective in treating low back pain radiating to the legs is acupuncture. The mechanism of action of acupuncture involves the central nervous system, thereby increasing the release of endorphins, enkephalins, and serotonin, which are effective in inhibiting the transmission of pain signals[8]. In addition to conventional acupuncture, an alternative therapy that can be used is ear acupuncture, which triggers the release of endorphins and neurotransmitters in the spinal cord so that pain perception is reduced [9].

To evaluate the level of pain due to sciatic nerve compression, the parameter used in this study was the Straight Leg Raise (SLR). (SLR) It is a clinical examination of objective parameters that is carried out by lifting the patient's straight leg in a supine position. If compression occurs in the sciatic nerve, this movement will trigger pain that radiates from the waist to the legs [10].

Based on patient visit data at the Independent Practice of Acupuncture, Healthy Families Acupuncture Kepahiang Bengkulu, the prevalence of patients with low back pain radiating to the feet was around 300 patients or 15% of approximately 2,000 patients from January to September 2024. This study aimed to determine the effect of combined local-point electroacupuncture and auricular acupuncture therapy on changes in pain scale (NRS) and straight leg raise (SLR) among farmers with radiating low back pain at the Healthy Family Independent Acupuncture Practice, Kepahiang, Bengkulu.

II. METHODS

This study employed a quasi-experimental design with a two-group pre-test–post-test approach. It was a quantitative study involving measurements before and after the intervention to evaluate the effects of combined local-point electroacupuncture and auricular acupuncture therapy on the pain scale and straight leg raise (SLR) among farmers with radiating low back pain. The study was conducted at the Healthy Family Independent Acupuncture Practice, located in Kepahiang, Bengkulu, Indonesia, from October 2024 to April 2025. This research site was selected because it provides regular acupuncture services for patients with musculoskeletal complaints, including radiating low back pain.

The study population consisted of patients with low back pain radiating to

the legs who sought treatment at the Healthy Family Independent Acupuncture Practice, Kepahiang, Bengkulu. Based on a preliminary study conducted from January to September 2024, approximately 300 patients were identified as having similar complaints. The sampling method used was purposive sampling, a non-random technique in which participants were selected based on specific inclusion and exclusion criteria. A total of 36 participants who met the eligibility criteria were included in this study. The inclusion criteria were male or female patients with unilateral radiating low back pain, working as farmers, whose pain was caused by work-related or physical activity–induced trauma, and without a history of severe disease such as tumors, cancer, tuberculosis, or coronary heart disease.

Participants had to be willing to participate through informed consent, report pain intensity between 4–6 on the Numeric Rating Scale (NRS), have an SLR range between 30°–70°, experience chronic pain lasting for at least three months, and be aged between 30–70 years. Participants were also required not to undergo any other therapy during the study period and to complete eight therapy sessions at a frequency of two sessions per week. Exclusion criteria included patients with bilateral radiating low back pain, participants who withdrew from the study, pregnant women, those with acute pain lasting three months or less, participants who did not complete all eight therapy sessions, and those who experienced a sudden decline in health condition during the intervention period.

Before the study began, participants who met the inclusion criteria were informed about the research objectives, procedures, potential benefits, and possible risks, and were asked to sign an informed consent form. Participants were then assigned to one of two groups. The first group received local-point electroacupuncture therapy, while the second group received a combination of local-point electroacupuncture and auricular acupuncture therapy. Both groups underwent eight therapy sessions over four weeks, with a frequency of two sessions per week. Electroacupuncture was performed at acupoints corresponding to the lumbosacral region—specifically BL23, BL25, BL40, and GB30—using sterile disposable needles connected to an electroacupuncture device. Electrical stimulation was applied with a low frequency (2–4 Hz) and moderate intensity, adjusted to the patient's comfort, for approximately 20–30 minutes per session.

In the combination therapy group, the same local-point electroacupuncture procedure was performed, followed by auricular acupuncture at points associated with the lumbosacral area and pain modulation, including Shenmen, Lumbar, Sciatic Nerve, and Subcortex. Needles were inserted gently and retained for 20 minutes. All interventions were performed by certified acupuncture therapists using standardized techniques to ensure consistency and safety. Pain intensity was assessed using the NRS, while functional improvement was measured using the SLR test. Both measurements were conducted before (pre-test) and after (post-test) the series of therapy sessions in each group to evaluate the degree of pain reduction and functional improvement.

Data were analyzed using SPSS. Descriptive statistics were used to summarize demographic characteristics and baseline measurements of participants. The normality of the data distribution was tested using the Shapiro–Wilk test. Since the data were not normally distributed, non-parametric tests were used. The Wilcoxon signed-rank test was applied to determine differences between pre-test and post-test scores within each group, while the Mann–Whitney U test was used to compare changes in NRS and SLR between the two groups. A p-value of less than 0.050 was considered

statistically significant. The results were presented in tables and interpreted according to their statistical and clinical relevance.

III. RESULT

This study was carried out as many as 8 therapy sessions with a frequency of 2 times a week. Data collection began with observation in the research field, then measured the pain scale with NRS and the pain range with SLR before therapy. The data obtained in this study are analyzed as follows.

Table 1. Characteristics of Respondents

Syndrome	Group I		Group II	
	N	%	N	%
Gender				
Female	8	22.2	9	25
Male	10	27.8	9	25
Age (years)				
30-40	5	13.89	3	8.33
41-50	5	13.89	6	16.67
51-60	5	13.89	3	8.33
61-70	3	8.33	6	16.67
Syndrome Differentiation				
Kidney Deficiency	6	16.67	7	19.44
Qi and Xue Stagnation	7	19.44	8	22.22
Cold Moisture Retention	4	11.11	4	11.1

In Table 1, it can be seen that the most gender data in women are 19 subjects, in the age range of 41-50 years, as many as 11 subjects, and the most syndrome differentiation is the stagnation of qi and xue, as many as 15 subjects. Before therapy in group I, the average pain scale (NRS) was 4.94, while after treatment, the average pain scale (NRS) became 2,94. Pada kelompok II rata-rata skala nyeri (NRS) nya adalah 4,94, sedangkan sesudah diberikan perlakuan rata-rata skala nyeri (NRS) nya menjadi 1.61. Then the average straight leg raise (SLR), in group I, the average straight leg raise (SLR) was 38.6°, while after treatment, the average straight leg raise (SLR) was 58.7°. In group II, the average straight leg raise (SLR) was 41.4°, while after treatment, the average straight leg raise (SLR) was 74.5°.

Table 2. The Result of the Wilcoxon Test

Group		N	p
I	Pretest	18	<0.001
	Posttest	18	
II	Pretest	18	<0.001
	Posttest	18	

Table Wilcoxon test in Table 2 showed a significant difference between pre-test and post-test scores in both groups (p<0.001), indicating that acupuncture interventions effectively reduced pain and improved outcomes in participants.

Table 3. The Result of the Mann-Whitney Test

Group	Mean Rank	p
I	12.11	<0.001
II	26.72	

Based on the Mann-Whitney test in Table 3, we can conclude that the more influential group is group 2 (combination therapy, electroacupuncture, local point, and ear acupuncture) because the value (NRS) decreased more at 12.11, and the value (SLR) increased by 26.72.

IV. DISCUSSION

Most research subjects were female, as many as 19 people (52.8%). Women who are in the premenopausal phase tend to have a higher level of sensitivity to pain than men. This is due to the influence of the hormone estrogen on the mechanism of pain perception pathways in the body. The hormone estrogen functions to modulate pain, interacting with the nervous system, such as serotonergic, noradre-

nergic, and opioids, but with age, this function decreases, increasing the risk of pain in women [12].

The most research subjects were in the age range of 41-50 years, which amounted to 11 people (30.6%). In the transition phase to the elderly, the intervertebral disc begins to undergo a degenerative process, which is characterized by the loss of fluid and elasticity of the cushions between the spine, so that the disc becomes thin, stiff, and herniated, which can press on the nerve roots of the spine. In addition, in this phase, there can also be spinal narrowing or spinal stenosis, which causes pressure on the nerves and triggers low back pain that radiates to the legs [13, 14, 15].

The most research subjects with qi and xue stagnation syndrome were 15 people (41.7%). Many of the research subjects with the female gender influence the number of these syndromes. The imbalance between physical activity and rest in women and the lack of nutritional intake causes blood to not flow smoothly, so it is easy to stagnate, especially if emotional stress in women that is not channeled such as prolonged sadness, pent-up anger, and anxiety, causes qi movement to be inhibited [16,17].

The mean pain scale (NRS) before intervention in groups 1 and 2 was 4.94. Meanwhile, the average pain scale reduction (NRS) after intervention in group 1 was 2.94, and the average pain scale reduction (NRS) in group 2 was 1.61. This difference in results is influenced by the point of stimulation used in the two different groups. Local spot electroacupuncture only stimulates the pain area, while the combination of ear acupuncture points can regulate the endogenous analgesic system, increase the relaxation and analgesic effect, and stimulate auricular vagus nerve stimulation faster and provide a double effect than just using electroacupuncture. Local Points [18,19].

The mean (SLR) before intervention in group 1 was 38.6° and the mean (SLR) in group 2 was 41.4°. Meanwhile, the mean data (SLR) after intervention for group 1 was 58.7° and the average (SLR) for group 2 was 74.5°. The increase in different SLRs in both groups was also influenced by the different methods in each group. Local spot electroacupuncture can release endorphins and improve blood circulation but only focuses on local pain in the waist area and lower legs, while the use of a combination of ear acupuncture focuses on important nerve objectives such as lumbar spine (AH 5&6) and sacral spine (AH 7), stimulates the central nervous system such as the hypothalamus, brainstem, and spinal cord which are able to improve the motor function of the study subjects so that SLR can increase more significantly [19, 20, 21, 22].

Based on the results of the Wilcoxon Test, the results of $p<0.001$, It can be concluded that there is a significant change in the numeric rating scale (NRS) and straight leg raise (SLR) pain in low back pain radiating to the legs. On the Mann-Whitney test, the decrease in the Mean Rank on the pain scale (NRS) in the local spot electroacupuncture group was 24.89, and in the local spot electroacupuncture and ear acupuncture group was 12.11. Meanwhile, in the degree of pain (NRS), there was an increase in the Mean Rank in both groups, namely in the local spot electroacupuncture group of 10.28 and in the local point electroacupuncture group and ear acupuncture of 26.72. So, the conclusion of the hypothesis is that the combination therapy of local spot electroacupuncture and ear acupuncture has an effect on changes in pain scale (NRS) and straight leg raise (SLR)

Acupuncture physiologically helps relieve pain and normalize modulation in areas of the brain such as the Default mode network (DMN) and Descending pain modulating system (DMNS), helping the release of endogenous opioids that inhibit pain signals in the spinal cord area, thereby reducing radicular pain in cases of low back pain that radiates to the legs.

With the addition of equipment modalities such as electrostimulators in low frequencies of 2-10 Hz with continuous waves, it can help inhibit pain through the release of endorphin, serotonin, and noradrenaline, which have an analgesic effect by inhibiting pain receptors in the spinal cord and brain. It also helps to improve blood flow to the area of pain and relax tense muscles (14, 21, 22, 23, 24).

The combination of ear acupuncture therapy in low back pain radiating to the legs also has a positive influence in regulating pain. The selection of the lumbar spine (AH 5-6) and sacral spine (AH 7) helps relieve lumbar-sacral area pain(19). By leaving the needle on the surface of the ear for several days, ear acupuncture functions in activating the Descending pain modulating system (DMNS) so that the transmission of pain from the spinal cord to the brain can be controlled and inhibited, in addition to this point can also reduce inflammation, speed up the pain healing process, and help the body to stimulate endorphins and serotonin in the pain system (18,20).

V. CONCLUSION

Most participants were aged 41–50 years (30.6%), predominantly female (52.8%), and the most common syndrome identified was Qi and Xue stagnation (41.7%). The mean pre-intervention pain scale (NRS) in both groups was 4.9, with an average SLR of 38.6° in the local-point electroacupuncture group and 41.4° in the combination therapy group. After the intervention, the mean NRS decreased to 2.94 in the local-point electroacupuncture group and 1.61 in the combination therapy group. The mean SLR increased to 58.7° and 74.5°, respectively. The combination of local-point electroacupuncture and auricular acupuncture showed a greater effect on reducing pain and improving SLR, with a mean NRS decrease of 3.3 and mean SLR increase of 33% ($p < 0.001$).

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