

Part A. THESIS INTRODUCTION

1. ABSTRACT

Lumbar spine pain, also known as low back pain (LBP), is a localized pain from L1 to buttock (which may be on one side or both sides). This is the most common arthritis in clinical practice.

Degenerative spondylolisthesis (DS) is a common cause of LBP, in which degenerative vertebra L5 mainly happens due to its bearing whole gravity of the upper body. Currently, there are many methods of treatment: surgical intervention, drug treatment, non-drug treatment, etc. in which the electroacupuncture is a commonly chosen method because it controls the pain and stimulates the production of Endorphin, Acetylcholine, Serotonin, and it is very safe.

The Jia ji point L5 is located 0.5 inch towards two sides at the below head the spine of lumbar vertebrae. It is an acupuncture point outside Meridian which is commonly used in clinical practice when it is punctured with other points for the treatment of lower back pain due to DS, and the treatment effect is very effective. However, up to now, there has been no research on the characteristics of location, structure, biological and pathological characteristics of Jia ji point L5 and how pain relief after acupuncture performance affects organ systems in the body. To contribute to the clarification of some characteristics of Jia ji point L5 in normal adults as well as in LBP patients due to DS and to prove the scientific value of electroacupuncture on point L5 in treating LBP patients, we have conducted the study of the subject: **Research on characteristics of Jia Ji point L5 and effect of electroacupuncture on treatment of low back pain due to degenerative spondylolisthesis**

2. OBJECTIVES

- To determine some characteristics of skin surface area, temperature and intensity of electrical current on point L5 in normal adults from the age of 18 - 60.
- To determine changes in some features of point L5 in patients with low back pain due to low-cold-state degenerative spondylolisthesis in traditional medicine.
- To evaluate treatment results of low back pain due to degenerative spondylolisthesis in traditional medicine by electroacupuncture on point L5 combined with prescription of the Ministry of Health (Procedure No. 24).

3. THESIS PRACTICAL MEANING AND NEW CONTRIBUTION

Electroacupuncture is a method of applying electrical impulses to acupressure points through the needles and a new acupuncture development step and a method of combining modern medicine with traditional medicine, promoting both the effect of the electrical current for treatment and acupuncture. There are many studies on the mechanism of acupuncture action and intensive researches on the characteristics of each acupuncture point on Meridian, but there is no research topic on acupuncture point characteristics outside Meridian. The research topic of some characteristics of acupuncture point L5 basically contributes to clarifying the nature of acupuncture points according to traditional medicine in general and acupuncture points outside Meridian in particular. At the same time, the study also confirms the effectiveness of electroacupuncture in the treatment of low back pain (LBP) due to degenerative spondylolisthesis (DS), a common clinical disease; There are many good treatments but they have some shortcomings such as drug side effects, expensive price or difficult conduction, etc. Therefore, electroacupuncture is an easy-to-do method and often chosen due to pain control and safety.

Based on the results of our study, we have demonstrated the objective existence of acupuncture points. The quantification of chemical intermediates involved in pain control is important in the quantification of analgesic effect of electroacupuncture into persuasive evaluation indicators in the study. This is a scientific study of traditional medicine involving high quantitative value in clinical practice.

Acupuncture plays an important role in the oriental traditional medicine system in Vietnam. Long time ago, our ancestors widely used acupuncture in disease prevention and treatment for people. This is a very familiar medical technique interested by Vietnamese people.

Apart from abstract, conclusion and recommendation, the thesis has 4 chapters:

Chapter 1. Literature review	33 pages
Chapter 2. Subject and method	23 pages
Chapter 3. Result	32 pages
Chapter 4. Discussion	33 pages

The thesis has 38 tables, 7 graphs, 10 pictures, 2 diagrams, 6 appendices and 110 references (86 in Vietnamese and 24 in foreign languages).

Part B. THESIS CONTENT

Chapter 1. LITERATURE REVIEW

1.1. Acupoint definition

- **Acupoint definition:** Acupoint is the place concentrating spirit and reflecting the function of the body. It is also the gateway for the negative spirit to penetrate the body, so it reflects the pathology of the meridians.

- **Acupoint classification:** There are three major types of acupoints on the body: acupoint located on meridian, acupoint located outside meridian and Tian Ying Xue point.

- **Acupoint's shape characteristics:** In terms of the shape and skin area of acupoint: scientists in the study of acupuncture have pointed out that the acupoint on the body is not only a point, but each acupoint has its corresponding area on the skin. Most acupoints are circle, and they occupy a certain position on the skin surface. The size of the acupuncture points ranges from 4 to 18 mm²; they are more sensitive with more specific functions than the surround area.

- **Biological characteristics of acupoint:** There are differences in temperature, skin resistance and transcutaneous current intensity between the acupoint and its surrounding area and among acupoints on the normal adults.

1.2. Electroacupuncture: Electroacupuncture is a method of applying electrical impulses to the acupoints through the needles. It is a new acupuncture development step and a method of combining modern medicine with traditional medicine.

1.3. Mechanism of pain relief effect of acupuncture according to traditional medicine: Needle is used to stimulate into the acupoint with the purpose of blood regulation in order to maintain the normal body function and eliminate the balance loss phenomena. The basis of acupuncture is meridian and acupoint; Impact on acupoint a suitable amount of stimulation so that we can regulate the spirit, thus regulating the blood. When blood is regulated, spirit circulation in Meridian functions well along with good blood circulation and yin and yang balance recovery, bringing the body back to normal physiological state.

1.4. Mechanism of pain relief effect of acupuncture according to modern medicine: According to Neural theory, the substances involved in the anti-pain mechanism include endogenous morphine (endorphin, enkephalin), serotonin and catecholamines. The most important neurotransmitters are beta-endorphin, met-enkephalin, leu-enkephalin and dynorphin. There are many types of

endorphin, but the most active is beta-endorphin. Endorphin is formed from a precursor substance named beta- lipotropin - a peptide with large molecule commonly appearing in Pituitary.

1.5. Jia Ji point L5 and its usage in treatment

- **Location:** Jia ji point L5 is located 0.5 inch towards two sides at the below head the spine of lumbar vertebrae; there are 2 acupoints both on the right and left.

- **Anatomy:** Under the skin is a large back muscle bundle; under the deep muscle layer is the inter-muscle - spinal muscle, semi-spinal muscle, transverse -muscle - spinal muscle, m. gluteus minimus, muscle of perineum. Motor neurons are branches of the spinal nerve root and Plexus lumbosacraris. The acupoint area is dominated by the L5 segment.

- **Effect:** Treatment of lower back pain, sciatica pain, lower limb paralysis, urogenital diseases, anesthesia for lower abdominal and lower limb surgery.

- **How to acupuncture:** Acupressure the point of 0.3-0.5 inches; it is able to penetrate the Jia ji points and perform moxibustion in 10-15 minutes.

1.6. Low back pain due to degenerative spondylolisthesis according to modern medicine

- **Clinical symptoms:** The disease usually occurs in people over the age of 30 with symptoms:

+ Pain location: symmetrical pain on both sides of the spine ; the pain does not usually spread.

+ Realistic signs of spinal syndrome: vertebral column pain point, crest pain point, cramp in paravertebral muscle, spinal deformity, limited spinal movement

+ Elasticity measure of the lumbar spine (Schober test): $\leq 4/10$ cm

- **X-ray signs:** X-ray films often referring the lumbar spine in a straight or inclined position shows the general signs of spinal degeneration; When tested, peripheral and biochemical blood cells are normal

- **Treatment:** + Treatment according to symptoms (anti-inflammatory, analgesic drug, muscle relaxant, etc.) combined with slow-acting and anti-degradation agents.

+ Combination of medical treatment, physical therapy and rehabilitation. In case of root compression, surgical indication may be applied.

1.7. Low back pain according to traditional medicine

According to traditional medicine, backache is described in the name "yāo tòng" involving symptom mainly of pain on one side or two sides or the

middle of the waist area. Its cause is due to the body sensing the negative spirit, leading to bad blood circulation or due to kidney not functioning properly or failure to take care of the kidney. This is a symptom of the patient's self-perception. This disease can occur in all four seasons of the year.

Low-cold-state low back pain according to traditional medicine

- *Clinical symptoms:* Cold back pain happens due to weather change, cold rain or cold catching, making the disease worse; when it is warm, pain is relieved. The attached symptoms are: difficult posture change, unrelieved pain when lying down, fatigue, cold limb tips, being full, less eating activities, pale tongue, white tongue moss, press or slow sinking pulse.

- *Treatment method:* to alleviate the low-cold state and help blood circulation.

- *Medicine:* FASTT Patch (Herba Taraxaci)

- *Electroacupuncture on points:* Jia ji point L5, Shèn shū, Yāo yáng guān, Cì liáo, Huán tiào, Wěi zhōng, Kūn lún, Yáng líng quán.

- *Ear acupuncture:* Shen Men, liver or spleen, kidney, adrenal gland

- *Other treatment methods:* To wear mugwort belt, moxibustion, acupuncture using plum-blossom needle, Acupoint massage, Parenteral drug, etc.

Chapter 2 SUBJECT AND METHOD

2.1. RESEARCH LOCATION AND SUBJECT

2.1.1. Research location and time

The study was conducted at the National Hospital of Acupuncture from August 2016 to October 2017.

2.1.2. Research subject

2.1.2.1. Normal adults

180 volunteers learning, working and living normally without skin lesions or scars in the lumbar area. The age was at least 18. Based on the stages of development of the body, according to traditional medicine theory, the study subjects were divided into three age groups:

- Age group of 18 – 29: having the stage of most well-functioned blood circulation with fleshy muscles: 60 people

- Age group of 30 – 39: having the period of stabilizedly functioning organs with firm muscles: 60 people

- Age group of 40 or more: the period of organs and meridians not functioning well anymore and organ function beginning to decline (hereinafter referred to as age group of over 40): 60 people.

2.1.2.2. LBP patients due to DS

Patients with age of 30 - 60 having symptoms of LBP due to DS.

*** Criteria for selecting patients according to modern medicine**

Patients diagnosed with LBP with the following clinical symptoms:

- Lumbar pain occurred ≤ 6 days and does not spread to the thighs and legs

- VAS point: ≥ 5 ;

- Schober sign: $\leq 14/10$ cm

- X-ray films often referring the lumbar spine in a straight or inclined position shows image of degenerative lumbar spine (bone spurs, joint space narrowing, cartilage thickening)

*** Criteria for selecting patients according to traditional medicine**

Patients with LBP selected according to the standard of modern medicine along with low-cold state LBP according to traditional medicine had symptoms as follows: Pain in the waist area, increase pain due to weather change, cold rain or cold catching, making the disease worse; when it is warm, pain is relieved; difficult posture change, unrelieved pain when lying down, fatigue, cold limb tips, being full, less eating activities, pale tongue, white tongue moss, press or slow sinking pulse.

*** Criteria for exclusion from study**

- Patients with back pain without DS according to standard of modern medicine or low-cold state according to traditional medicine standards, back pain due to tuberculosis, inflammation, injury, etc.), back sciatica pain.

- Patients with back pain accompanied by other diseases such as heart failure, mental illness or dementia.

- Patients having involved lumbar surgery, skin lesions or scars in the lumbar area, coagulopathy or using anticoagulants; pregnant women.

- Patient using other treatments.

- Patient refusing to participate in the study

2.2. RESEARCH METHOD

2.2.1. Research design

The research includes:

- **Cross-sectional study:** to study characteristics of Jia Ji point L5 on the right and the left:

+ **Normal adult group:** are ordinary people studying, working and living normally, receiving medical examination and classification into health type I and type II (according to Decision No. 1613 / BYT-QD dated 15 August 1997 of the Minister of Health on medical classification criteria for recruitment and periodical examination for laborers)

+ **Patient group:** LBP patients with low-cold-state DS treated at the National Hospital of Acupuncture.

- **Interventional study:** A prospective clinical trial conducted to compare the study patient group before treatment with after treatment and with the control patient group:

+ **Study patient group (group I):** LBP patients due to DS were treated with electroacupuncture under the Ministry of Health's prescription (Procedure No. 24) with dispersing on Shèn shū, Yāo yáng guān; tonifying on Cì liáo, Huán tiào, Wěi zhōng, Yáng líng quán, Kūn lún and Jia Ji point L5 (on the left and right).

+ **Control patient group (group II):** Having the same acupuncture approach as group I's **without acupuncture point L5.**

2.2.2. Research indicators

+ Superiorcutaneous position, shape and area

+ Skin temperature at the acupoint

+ Transcutaneous current intensity

- *Efficacy indicators of electroacupuncture in LBP treatment*

+ Pain intensity assessed on a VAS scale

+ Pain threshold

+ Schober sign

+ Function improvement level of of LBP patients by Roland Morris's Low back pain Question (RMQ) established by Roland Morris

+ β -endorphin level in the blood of 30 patients in the study group and 30 patients in the control group (similar in age, gender and pain level).

2.2.3. Evaluation of general treatment results:

Evaluation of treatment outcomes was based on the total score of the three study indexes, including pain score on VAS scale, improvement of lumbar spine elasticity and function improvement according to Roland Moris's questionnaire.

Disease level	Point	Treatment result
No disease	10 to 12	Excellent
Low	7 to 9	Good
Medium	4 to 6	Fair
High	≤ 3	Poor

2.2.4. Data processing

- All data collected in the study was processed according to the medical statistical method using SPSS 16.0 software.

- Parameters used in the study:

- + Sample average
- + Standard Deviation (SD)
- + Percentage (%)

- Tests used in the study:

- + Comparison between 2 average values via Test T - student
- + Ratio comparison by inspecting χ^2

- Results were considered as statistically significant when $p < 0.05$

Chapter 3 RESULT

3.1. Jia Ji point L5 characteristics on normal adults

3.1.1. Location, shape and area of Jia Ji point L5

The Jia ji point L5 is located 0.5 inch, equivalent to 10.90 ± 1.10 mm, towards two sides at the below head the spine of lumbar vertebrae. Most of superiorcutaneous points were circular; some were oval. The superiorcutaneous point had the area of 12.99 ± 0.49 mm²

3.1.2. Superiorcutaneous characteristics of temperature and current intensity of Jia Ji point L5

Table 3.1. Superiorcutaneous temperature ($^{\circ}$ C) at and outside Jia Ji point L5 according to age group and gender (n=180).

Age group	At acupoint (a)			Outside acupoint (b)		
	Male ($\bar{X} \pm SD$)	Female ($\bar{X} \pm SD$)	p	Male ($\bar{X} \pm SD$)	Female ($\bar{X} \pm SD$)	p
18-29 (1)	32,44 \pm 0,58	32,46 \pm 0,57	>0,05	31,63 \pm 0,68	31,67 \pm 0,58	>0,05
	32,45 \pm 0,58			31,65 \pm 0,62		
30-39 (2)	32,39 \pm 0,49	32,40 \pm 0,49	>0,05	31,56 \pm 0,61	31,62 \pm 0,69	>0,05
	32,39 \pm 0,52			31,58 \pm 0,63		
≥ 40 (3)	32,30 \pm 0,59	32,31 \pm 0,59	>0,05	31,47 \pm 0,69	31,52 \pm 0,70	>0,05
	32,30 \pm 0,43			31,49 \pm 0,67		
p ₁₋₂	>0,05	>0,05		>0,05	>0,05	
p ₂₋₃	>0,05	>0,05		>0,05	>0,05	
p ₁₋₃	<0,05	<0,05		<0,05	<0,05	
General	32,36 \pm 0,60			31,56 \pm 0,69		
p _{a-b}	<0,01					

Comment: In both genders, in the left and right of the three groups, superiorcutaneous temperature at acupoint was significantly higher than that outside acupoint ($p < 0.01$). There was no statistically significant difference in temperature at the acupoint area between the genders as well as between the two sides of the body.

Table 3.2. Transcutaneous current intensity (μA) at and outside Jia Ji point L5 according to gender and age group ($n=180$).

Age group	At acupoint (a)			Outside acupoint (b)		
	Male ($\bar{X} \pm SD$)	Female ($\bar{X} \pm SD$)	p	Male ($\bar{X} \pm SD$)	Female ($\bar{X} \pm SD$)	p
18-29 (1)	97,51 \pm 7,67	97,77 \pm 7,66	>0,05	11,10 \pm 0,39	11,11 \pm 0,38	>0,05
30-39 (2)	96,41 \pm 7,77	96,54 \pm 7,46	>0,05	11,10 \pm 0,47	11,11 \pm 0,28	>0,05
≥ 40 (3)	95,32 \pm 7,69	95,50 \pm 7,67	>0,05	10,17 \pm 1,37	10,22 \pm 1,40	>0,05
p₁₋₂	>0,05	>0,05		>0,05	>0,05	
p₂₋₃	>0,05	>0,05		>0,05	>0,05	
p₁₋₃	<0,05	<0,05		<0,05	<0,05	
General	96,52 \pm 7,48			10,56 \pm 1,48		
p_{a-b}	<0,001					

Comment: In both genders, in the left and right of the three groups, Transcutaneous current intensity at acupoint was much higher than that outside acupoint ($p < 0.001$). There was no statistically significant difference in temperature at the acupoint area between the genders as well as between the two sides of the body.

3.2. Jia Ji point L5 characteristics in LBP patients

Table 3.3. Superiorcutaneous temperature ($^{\circ}C$) at Jia Ji point L5 in LBP patients due to DS according to age group and gender ($n=120$)

Age group	Male ($\bar{X} \pm SD$)	Female ($\bar{X} \pm SD$)
30-39 (n=28)	31,44 \pm 0,59	31,50 \pm 0,54
	31,47 \pm 0,55	
≥ 40 (n=92)	31,43 \pm 0,57	31,51 \pm 0,57
	31,46 \pm 0,57	
General according to gender	31,44 \pm 0,58	31,50 \pm 0,56
General	31,47 \pm 0,57	

Comment: Superiorcutaneous temperature at Jia Ji point L5 in LBP patients due to DS was $31.47 \pm 0.57^{\circ}C$

Table 3.4. Current intensity (μA) at Jia Ji point L5 in LBP patients due to DS according to age group and gender (n=120)

Age group	Male (a) ($\bar{X} \pm \text{SD}$)	Female (b) ($\bar{X} \pm \text{SD}$)
30-39 (n=28)	66,68 \pm 6,19	66,71 \pm 6,26
	66,70 \pm 6,06	
≥ 40 (n=92)	65,68 \pm 6,22	65,78 \pm 6,42
	65,72 \pm 6,32	
General according to gender	65,68 \pm 6,21	65,75 \pm 6,34
General	65,71 \pm 6,28	

Comment: Transcutaneous current intensity at Jia Ji point L5 in LBP patients due to DS was $65.71 \pm 6.28 \mu\text{A}$

Table 3.5. Characteristics of skin temperature ($^{\circ}\text{C}$) at acupoint L5 in LBP patients due to DS compared to normal adults at the age of 30-60

Group Location	Skin temperature ($^{\circ}\text{C}$)			
	LBP patients (a) (n=120)		Normal adults (b) (n=120)	
	Male (3) ($\bar{X} \pm \text{SD}$)	Female (4) ($\bar{X} \pm \text{SD}$)	Male (3) ($\bar{X} \pm \text{SD}$)	Female (4) ($\bar{X} \pm \text{SD}$)
Right (1)	31,43 \pm 0,57	31,50 \pm 0,57	32,34 \pm 0,58	32,36 \pm 0,55
Left (2)	31,45 \pm 0,59	31,51 \pm 0,54	32,32 \pm 0,57	32,38 \pm 0,51
General according to side	31,44 \pm 0,58	31,50 \pm 0,56	32,33 \pm 0,57	32,37 \pm 0,52
General	31,47 \pm 0,57		32,35 \pm 0,54	
p	$p_{1-2} > 0,05$; $p_{3-4} > 0,05$; $p_{a-b} < 0,05$			

Comment: Skin temperature at acupoint L5 in LBP patients due to low-cold-state DS was $31.47 \pm 0.57^{\circ}\text{C}$, significantly lower than that of normal adults of $32.35 \pm 0.54^{\circ}\text{C}$ in both genders as well as both sides of the body. ($p < 0.05$)

Table 3.6. Characteristics of transcutaneous current intensity (μA) at Jia Ji point L5 in LBP patients due to low-cold-state DS compared to normal adults at the age of 30-60

Location \ Group	Transcutaneous current intensity (μA)			
	LBP patients (a) (n=120)		Normal adults (b) (n=120)	
	Male (3) ($\bar{X} \pm \text{SD}$)	Female (4) ($\bar{X} \pm \text{SD}$)	Male (3) ($\bar{X} \pm \text{SD}$)	Female (4) ($\bar{X} \pm \text{SD}$)
Right (1)	65,66 \pm 6,19	65,63 \pm 6,31	95,87 \pm 7,29	95,92 \pm 7,27
Left (2)	65,70 \pm 6,22	65,86 \pm 6,38	95,90 \pm 7,42	95,98 \pm 7,58
General according to side	65,68 \pm 6,21	65,75 \pm 6,34	95,88 \pm 7,39	95,95 \pm 7,49
General	65,71 \pm 6,28		95,91 \pm 7,42	
p	$p_{1-2} > 0,05$; $p_{3-4} > 0,05$; $p_{a-b} < 0,001$			

Comment: Transcutaneous current intensity at Jia Ji point L5 in LBP patients due to low-cold-state DS was 65.71 \pm 6.28 μA , remarkably lower than that of normal adults of 95.91 \pm 7.42 μA ($p < 0.001$).

3.3. Results of electroacupuncture on Jia Ji point L5 in LBP treatment due to low-cold-state DS

3.3.1. Characteristics of LBP patients due to DS

Table 3.7. Distribution of subjects by age

Age	Group I (1)		Group II (2)		Total		P_{1-2}
	n	%	n	%	n	%	
30 - 39	14	23,33	14	23,33	28	23,33	
40 - 49	23	38,33	24	40,00	47	39,17	
50 - 60	23	38,33	22	36,67	45	37,50	
Total	60	100,00	60	100,00	120	100,00	
Average age ($\bar{X} \pm \text{SD}$)	46,36 \pm 13,24		45,65 \pm 12,52		45,50 \pm 13,01		>0,05

Comment: LBP due to DS mainly occurred in the age group of over 40.

Table 3.8. Distribution of subjects by gender

Group \ Gender	Male (1)		Female (2)		Total	
	n	%	n	%	n	%
Group I (a)	26	43,33	34	56,67	60	50,00
Group II (b)	28	46,67	32	53,33	60	50,00
2 groups in general	54	45,00	66	55,00	120	100,00
p	$P_{1-2} > 0,05$; $P_{a-b} > 0,05$					

Comment: The rate of suffering low-cold-state LBP between men and women was equivalent ($p>0.05$)

Table 3.9. Distribution of subjects by occupation

Occupation \ Group	Group I (a) n = 60		Group II (b) n = 60	
	n	%	n	%
Heavy workload (1)	18	30,00	19	31,67
Heavy workload (2)	20	33,33	19	31,67
Intellectual work (3)	22	36,67	22	36,67
p	$p_{a-b}>0,05$			

Comment:

LBP due to low-cold-state DS occurred in all types of occupations, ranging from heavy to light workload (cleaner, homemaker) and to intellectual work ($p>0.05$). The difference in occupation type and distribution between group I and group II was not statistically significant with $p> 0.05$.

* Patient distribution according to prehistoric LBP in two groups demonstrated in chart 3.1

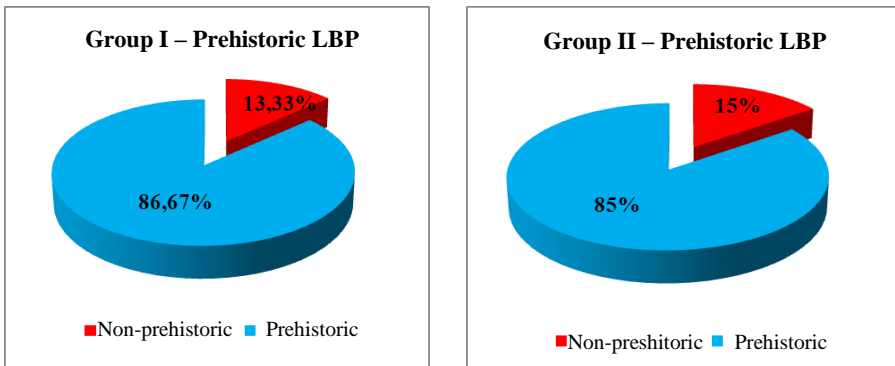


Chart 3.1. Patient distribution according to prehistoric LBP

Comment: The rate of patients with prehistoric LBP took up a big majority in both groups.

Table 3.10. X-ray film characteristics on lumbar spine

X-ray film result \ Group	Group I (n=60) (a)		Group II (n=60) (b)		General (n=120)	
	n	%	n	%	n	%
Bone spurs	15	25,00	15	25,00	30	25,00
Joint space narrowing	20	33,33	20	33,33	40	33,33
Cartilage thickening	3	5,00	3	5,00	6	5,00
Bone spurs + Joint space narrowing	10	16,67	9	15,00	19	15,83
Bone spurs + Cartilage thickening	1	1,67	2	3,33	3	2,50
Joint space narrowing + Cartilage thickening	1	1,67	0	0,00	1	0,83
DS + Degenerative L5	9	15,00	10	16,67	19	15,83
DS + Spinal deformity	1	1,67	1	1,67	2	1,67
Pa-b						

Comment: X-ray films of lumbar spine in two groups shown that in DS, joint space narrowing took up the highest proportion (33.33%), followed by bone spurs (25.00%); Bone spurs with joint space narrowing and DS with degenerative L5 accounted for equivalent proportions (15.83%); Cartilage thickening only took up for 5.00%; Bone spurs with cartilage thickening was less likely to happen (2.50%); Joint space narrowing with cartilage thickening and DS with spinal deformity were rare.

3.3.2. Clinical treatment results

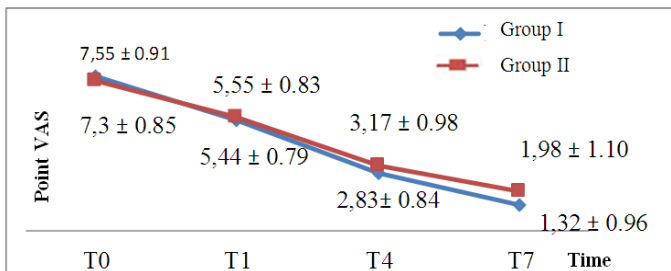


Chart 3.2: Change evaluation in post-treatment pain level under VAS scale

Comment:

- In group I, pain intensity gradually decreased from 7.55 prior to treatment to 5.54 days after one-day treatment, down to 2.83 after 4 days and 1.32 after 7 days.

- In group II, pain intensity also gradually decreased from 7.3 to 5.55 after one day, down to 3.17 after 4 days and 1.98 after 7 days of treatment. This improvement was statistically significant with $p < 0.01$

- The difference in pain level on the VAS scale between the two study groups before and after treatment was statistically significant ($p < 0.05$)

Table 3.11. Change in pain threshold (g / s) before and after treatment

Study time		Before	After one-day	After 7-day
		treatment (1)	treatment (2)	treatment (3)
Group		$(\bar{X} \pm SD)$	$(\bar{X} \pm SD)$	$(\bar{X} \pm SD)$
Group I (a) (n=60)	Pain threshold (g/s)	334,25 ± 22,16	434,24 ± 20,26	470,35 ± 18,21
	Coefficient K	$K_{1-2}=1,30 \pm 0,08$	$K_{1-3}=1,41 \pm 0,11$	$K_{2-3}=1,08 \pm 0,07$
	p	$p_{1-2} < 0,01$	$p_{1-3} < 0,01$	$p_{2-3} < 0,05$
Group II (b) (n=60)	Pain threshold (g/s)	338,17 ± 18,20	368,67 ± 23,19	398,28 ± 29,22
	Coefficient K	$K_{1-2}=1,09 \pm 0,08$	$K_{1-3}=1,18 \pm 0,12$	$K_{2-3}=1,08 \pm 0,08$
	p	$p_{1-2} < 0,01$	$p_{1-3} < 0,05$	$p_{2-3} < 0,05$
p		$p_{a-b} > 0,05$	$p_{a-b} < 0,05$	$p_{a-b} < 0,01$

Comment: Post-treatment pain threshold was higher than that before treatment. Pain threshold in Group I increased from 334.25 ± 22.16 before treatment to 470.35 ± 18.21 after treatment with $p < 0.01$. Pain threshold in Group II increased from 338.17 ± 18.20 before treatment to 398.28 ± 29.22 after treatment with $p < 0.05$.

Table 3.12. Function improvement of patients after treatment according to RMQ questionnaire

Evaluation rate	Group I (n=60) (1)		Group I (n=60) (2)		Group I (n=60) (2)		Group I (n=60) (2)	
	T0 (a)		T7 (b)		T0 (a)		T7 (b)	
	n	%	n	%	n	%	n	%
Excellent (no effect)	0	0,00	55	91,67	0	0,00	40	66,67
Good (less effect)	1	1,67	5	8,33	1	1,67	18	30,00
Fair (average effect)	11	1,33	0	0,00	12	20,00	2	3,33
Poor (much effect)	48	80,00	0	0,00	47	78,33	0	0,00
p	$p_{a-b} < 0,001$				$p_{a-b} < 0,01$			
	$p_{1-2} < 0,05$							

Comment: After 7-day treatment, function improvement remarkably changed in both groups with $p < 0.001$; there was no patient at fair and poor level anymore ($p < 0.001$). In particular, excellent level in group I accounted for 91.67%; excellent level in group II took up 66.67%.

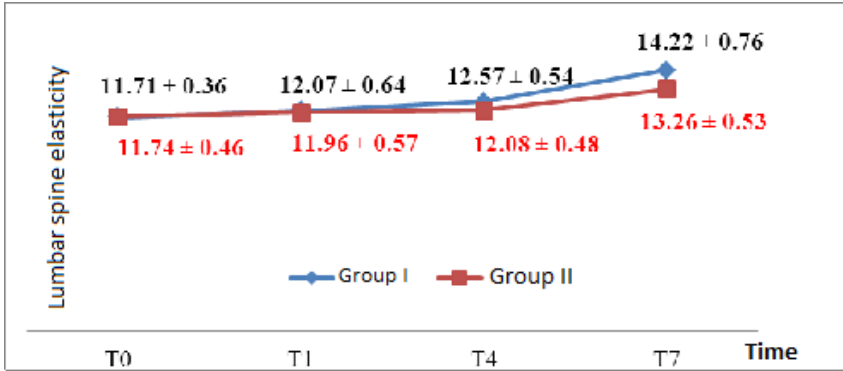


Chart 3.3. Evaluation of analgesic efficacy after Schober test

Comment: After 1-day and 4-day treatment, lumbar spine elasticity in both groups increased; however, there was no statistical significance with $p > 0.05$. After 7-day treatment, lumbar spine elasticity was significantly improved compared with that before treatment with $p < 0.05$. The improvement of the lumbar spine elasticity of group I from 11.7 ± 0.36 (cm) to 14.22 ± 0.76 (cm) was better than that of group II from 11.74 ± 0.46 (cm) to 13.26 ± 0.53 (cm). The difference between the two groups was statistically significant at $p < 0.05$.

3.3.3. Characteristic change in Jia Ji point L5 in LBP patients due to low-cold-state DS under electroacupuncture effect

Table 3.13. Change in skin temperature ($^{\circ}\text{C}$) at Jia Ji point L5 in LBP patients due to low-cold-state DS under electroacupuncture effect ($n=60$)

Group	Time	Skin temperature ($^{\circ}\text{C}$)			p
		T ₀ (1)	T ₁ (2)	T ₇ (3)	
Patient in group I (a)		$31,47 \pm 0,57$	$31,62 \pm 0,34$	$32,14 \pm 0,46$	$p_{1,3} < 0,05$
Normal adults (b)		$32,35 \pm 0,54$			
		$p_{1-b} < 0,05$	$p_{2-b} < 0,05$	$P_{3-b} > 0,05$	

Comment: Skin temperature at Jia Ji point L5 in LBP patients due low-cold-state DS after 7-day treatment increased compared to that before treatment ($p < 0.05$), and it nearly returned to the index of normal adults ($p > 0.05$).

Table 3.14. Change in transcutaneous current intensity (μA) at Jia Ji point L5 in LBP patients due low-cold-state DS under electroacupuncture effect (n=60)

Group	Time	Transcutaneous current intensity (μA)			p
		T ₀ (1)	T ₁ (2)	T ₇ (3)	
Patient in group I (a)		65,71 \pm 6,28	74,51 \pm 6,32	95,79 \pm 7,46	p ₁₋₃ <0,01
Normal adults (b)		95,91 \pm 7,42			
p		p _{1-b} <0,01	p _{2-b} <0,05	P _{3-b} >0,05	

Comment: Transcutaneous current intensity in LBP patients due low-cold-state DS after 7-day treatment was much higher than that before treatment (p<0.01), and it nearly returned to the index of normal adults (p>0.05)

3.3.4. β -endorphin content change in patients' blood over treatment times

Table 3.15. Content change in β -endorphin (ng/l) in blood of LBP patients due low-cold-state DS under electroacupuncture effect

Time	Group	Group I (a) (n=30)	Group II (b) (n=30)	P _{a-b}
		$\bar{X} \pm \text{SD}$	$\bar{X} \pm \text{SD}$	
T ₀ (1)		883,97 \pm 15,21	823,74 \pm 14,14	>0,05
T ₁ (2)		1160,391 \pm 18,34	975,09 \pm 17,28	<0,05
T ₇ (3)		1779,93 \pm 22,56	1367,93 \pm 21,32	<0,05
p		p ₁₋₂ <0,05 p ₁₋₃ <0,05	p ₁₋₂ <0,05 p ₁₋₃ <0,05	

Comment: Before treatment, β -endorphin content in both groups was not statistically significant with p>0.05. After 1-day and 7-day treatment, β -endorphin content in 2 groups increased; beta-endorphin content in the study group was higher than that in the control group with p<0.05.

Table 3.16. Treatment results

Treatment result	Group	Group I (a) (n=60)		Group II (b) (n=60)	
		n	%	n	%
Excellent		55	91,67	40	66,67
Good		4	6,67	18	30,00
Fair		1	1,67	2	3,33
No result		0	0,00	0	0,00
p		p _{a-b} <0,05			

Comment: Treatment results in group I: Excellent result: 91.67%; Good: 6.67%; Fair: 1.67%. Treatment results in group II: Excellent: 66.67%; Good: 30.00%; Fair 3.33%. No patient had poor treatment result.

- Excellent and good treatment results in both groups were ($p < 0.05$).

Chapter 4

DISCUSSION

4.1. Physiological characteristics of Jia Ji point L5 in normal adults

4.1.1. Location, shape and area of Jia Ji point L5

- Location:

Location result of Jia Ji point L5 was identified by taking CUN points (0.5 inches) equivalent to 10.89 ± 1.17 mm. The acupoint location determined by the machine was 10.90 ± 1.10 mm.

- Area:

Area of acupuncture point L5 we measured over 180 subjects were divided into 3 age groups according to the theory of traditional medicine: 60 people in age group of 18 - 29, the stage of most well-functioned blood circulation; 60 people in age group of 30 -39, the period of stabilizedly functioning organs and 60 people in age group of 40- 60, period of organs and meridians' function beginning to decline. In study process, it was seen that most of L5 points were circular; some were oval. Its average size was 12.99 ± 0.49 mm². There was no difference in the area of Jia Ji point L5 between the right and left, between genders as well as among age groups of subjects. Compared to research results of some authors when studying acu points of Zú sǎn lǐ, Sǎn yīn jiāo, Hé gǔ, Nèi guān and Shèn shū, Jia Ji point L5's area was smaller than that of Zú sǎn lǐ, Sǎn yīn jiāo and Shèn shū but bigger than that of Hé gǔ and Nèi guān. Jia Ji point L5 has a small area, so precise determination of the acupoint was necessary, playing an important role in treating the disease.

4.1.2. Skin temperature at Jia Ji point L5

Results showed no difference in skin temperature at Jia Ji point L5 between the two sides of the body and between the genders of the study subjects who were normal adults in all three age groups ($p > 0.05$). Thus, according to our research, the energy activity on both sides of the normal human body was always in balance, which was represented by the acupoint temperature similarity on both sides of the body. This was in accordance with yin - yang balance law of the yin -yang theory.

Comparison skin temperature at and outside Jia Ji point L5 according to age group showed that skin temperature at Jia Ji point L5 was $33.36 \pm 0.60^{\circ}\text{C}$,

which was higher than temperature outside L5 point of $31.56 \pm 0.69^{\circ}\text{C}$ in three age groups. According to modern medicine, the younger age, the higher the metabolism. In age group of 18- 29, the body was in the development stage, so the metabolism was very strong in the cells to meet the development needs of the body, so the body temperature was higher. According to traditional medicine, in the study groups, the age group of 18-29 was the stage of adulthood where the blood circulation began to function well. Age group of 30-39 was the stage stabilizedly functioning organs with firm muscles; blood circulation function was the best, and kidney spirit was in balance. Meanwhile, age group of over 40 was the period of organs and meridians not functioning well anymore and organ function beginning to decline with declined positive spirit; therefore, body temperature decreased gradually. Hence, the results of this study have contributed to the clarification of the traditional medicine knowledge about the process of human body development, showing the stage division of the body development of the ancients recorded in the ancient medical literature was reasonable along with scientific basis.

4.1.3. Transcutaneous current intensity at Jia Ji point L5

As we all know, with the same voltage, the current intensity is inversely proportional to the electrical current resistance, so in this content we only studied the transcutaneous electrical current intensity at point L5.

According to traditional medicine, on both sides of the normal human body, blood circulation is in balance for the body's activities to be harmonized. This was demonstrated by the electrobiological balance (Transcutaneous electrical current intensity) of Jia Ji point L5 at both sides of the body, in both men and women of all subjects ($p > 0.05$).

Transcutaneous current intensity at Jia Ji point L5 was $96.52 \pm 7.48 \mu\text{A}$. This index was 10 times higher than the transcutaneous current intensity outside the acupoint. Recent modern medicine studies suggested that acupoint is like the organizing center during shape development. An organization center is a group of small cells, which has high electrical conductivity (which can be considered as electrical sources). This determines and controls the development of a large group of other cells. When comparing acupoint with organizational center, there are many similarities.

4.2. Characteristics of Jia Ji point L5 in LBP patients due to low-cold-state DS

Results showed that in LBP patients due to low-cold-state DS, skin temperature at Jia Ji point L5 was $31.47 \pm 0.57^{\circ}\text{C}$, which was remarkably lower than that of normal adults of $32.35 \pm 0.54^{\circ}\text{C}$ with $p < 0.05$; Transcutaneous current intensity at Jia Ji point L5 in LBP patients due to low-cold-state DS was

65.71 ± 6.28 μA, lower than that of normal adults of 95.91 ± 7.42 μA (p<0.05). There was no difference in skin temperature and transcutaneous current intensity at Jia Ji point L5 in LBP patients due to low-cold-state DS according to age group and gender (p>0.05).

As noted above, skin temperature and transcutaneous current intensity reflected the nutrition of the body and the electrical conductivity of the skin. The figures of skin temperature and transcutaneous current intensity at Jia Ji point L5 in LBP patients due to low-cold-state DS in this research revealed that skin temperature and transcutaneous current intensity at Jia Ji point L5 was lower than that of normal adults in the same age and gender. This showed that when the body suffered from disease, blood circulation function in Meridian declined, thus nutrition and conductivity of the skin organization at Jia Ji point L5 in LBP patients due to low-cold-state DS decreased.

4.3. Results of electroacupuncture on Jia Ji point L5 in LBP treatment due to low-cold-state DS

4.3.1. Patient characteristic

The proportion of male and female patients was equivalent, which occurred at all occupation types from heavy workload, light workload to intellectual work. Subjects in the two patient groups in the age of 40 to 60 accounted for the highest proportion (76.67%). The older patients, the worse DS; it was because the aging of the body causing degeneration of the lumbar spine faster was an important factor leading to LBP.

Regarding the prehistory of the disease, the rate of patients with a prehistoric LBP was 86.67% in group I and 85% in group II compared with the rate of patients with no historic LBP. Thus, for patients with a prehistoric LBP due to spinal degeneration, the disease was much likely to reoccur.

Regarding features of X-ray films on degenerative lumbar spine, symptom of bone spurs took up the highest proportion (42.50%), followed by joint space narrowing (33.33%), bone spurs + joint space narrowing (15.83%); cartilage thickening accounted for only 5.00%. DS + degenerative L5 accounted for a high proportion of 15.83%. DS + Spinal deformity was rare. There was no difference in features of X-ray films of lumbar spine among patients of the two study groups (p>0.05).

4.3.2. Treatment results

- Change in the pain threshold and pain intensity

Pain and how to get rid of pain is always concerned by clinicians. In this study, we assessed pain by two methods, namely pain assessment based on

subjective perceptions of patients on a VAS scale, which is a widely used pain assessment scale in the studies and evaluation of pain intensity improvement based on pain threshold.

The average pain intensity variance on the VAS scale showed that the average pain scores on the VAS scale of the two study groups of patients were improved over time ($p < 0.05$).

In group I, average pain intensity score according to VAS scale gradually decreased from 7.55 ± 0.91 points before treatment to 1.32 ± 0.96 points after 7-day treatment. In group II, average pain intensity score according to VAS scale decreased similarly to that of group I in the first day; in the following days, pain alleviation level decreased from 7.3 ± 0.85 points to 1.98 ± 1.10 points after 7-day treatment. Pain relief in group I was better than in that in group II ($p < 0.05$).

With the same pain intensity, the study also determined the change in pain threshold; the minimum stimulus intensity that can cause a pain sensation is called pain threshold. To determine the human tolerance of the pain agent, we used a pain threshold measure machine called Analgesy-Metter (Italia). Results showed no difference in pain threshold before treatment between the two study groups ($p > 0.05$). In group I, patients' pain threshold increased from 334.25 ± 22.16 g/s to 434.24 ± 20.26 g/s after one-day treatment and increased to 470.35 ± 18.21 g/s after 7-day treatment. In group II, pain threshold increased from 338.17 ± 18.20 g/s before treatment to 368.67 ± 23.19 g/s after one-day treatment and increased to 398.28 ± 29.22 g/s after 7-day treatment ($p < 0.01$). Coefficient K for pain relief in group I after one-day treatment compared to that of pre-treatment was 1.31 ± 0.08 ; Coefficient K after 7-day treatment compared to that after one-day treatment was 1.24 ± 0.07 ; Coefficient K after 7-day treatment compared to that before treatment was 1.42 ± 0.11 , equivalent to coefficient K for pain relief in group II was 1.06 ± 0.08 , 1.06 ± 0.08 and 1.14 ± 0.12 ($p < 0.05$).

The results of change in pain threshold and pain intensity on the VAS scale revealed that the electroacupuncture had analgesic effect remaining stable throughout the treatment period through the ability to regulate the spirit. Thus, LBP due to DS treated by electroacupuncture would give good effect in pain relief for patients.

- Function improvement

Over the past several decades, research to find a common set of questions applied to LBP patients have been studied and developed. These questionnaires are often designed to provide information about the patient's health status due to the effect of the back pain or to evaluate the effectiveness of the various treatment methods, thus physicians can make decisions for the treatment of patients.

In this study, we used the Roland Morris Low Back Pain Questions (RMQ) which were proposed by Roland and Morris in 1983 and always adjusted in accordance with the goals of the disease assessment. The study results showed that the function in LBP patients was limited due to pain, but under effect of electroacupuncture in group I (Acupuncture prescription according to Procedure no. 24 of the Ministry of Health combined with acupuncture on Jia Ji point L5), this index improved better than that in group II (Acupuncture prescription according to Procedure no. 24 of the Ministry of Health without combination with acupuncture on Jia Ji point L5) ($p < 0.05$).

In the two study groups, function improvement after 7 days of treatment and the end of treatment achieved excellent and good results in group I, which were much higher than those in group II. In particular, in group I, after 7-day treatment, excellent result was 91.67% while excellent result in group II was 56.67%. In group I, after treatment, good result was 8.33% and 43.33% in group II. No poor result was present in both groups. Difference in daily function level of the two groups was statistically significant at $p < 0.05$.

- Improvement in lumbar spine elasticity

Pain and movement restriction are two common symptoms and problems for patients to seek treatment. Symptoms of cramp in paravertebral muscle, contraction of the linking organizations including muscular vein, ligaments, joint capsule, etc. limit the lumbar spine movement, especially decreasing lumbar spine elasticity. Lumbar spine elasticity in normal adults was 4-6cm; any lesion in the lumbar spine affects this index. In our study, LBP patients had most of the symptoms of lumbar spine pain syndrome expressed by pain, movement restriction and cramp in paravertebral muscle.

As a result at the time before treatment, the elasticity of group I was 1.71 ± 0.36 ; the elasticity of group II was 1.74 ± 0.46 ; The difference between the two groups was not significant with $p > 0.05$. After 4 days of treatment, lumbar

spine elasticity increased in both groups; the elasticity in group I was 2.57 ± 0.54 ; the elasticity in group II was 2.08 ± 0.48 . After 7 days of treatment, lumbar spine elasticity in group I was 4.22 ± 0.76 ; the elasticity in group II was 3.26 ± 0.53 . Hence, electroacupuncture on Jia Ji point L5 combined with acupuncture prescription according to Procedure no. 24 of the Ministry of Health had the better effect of improving lumbar spine elasticity in LBP treatment due to DS than acupuncture prescription according to Procedure no. 24 of the Ministry of Health without combination with electroacupuncture on Jia Ji point L5. The difference of improvement of lumbar spine elasticity between group I and group II after 7 days of treatment was statistically significant at $p < 0.05$.

- Chang in β -endorphin content LBP in patients' blood due to low-cold-state DS under electroacupuncture effect

Electroacupuncture generated impulses that passed through the nerve fibers to the hypothalamus, releasing Endorphin. Endorphins were released about 20 minutes after electroacupuncture. Hence, after electroacupuncture, released β -endorphin content was more than that before electroacupuncture. The figure in group I before treatment was $883.97 \pm 15.21\text{ng/l}$; the figure after 30-minute treatment increased to $1160.391 \pm 18.34\text{ng/l}$. The difference was statistically significant with $p < 0.05$. This change was significantly different at $p < 0.05$ after 7 days of treatment when results shown that β -endorphin content increased to $1779.93 \pm 22.56 \text{ ng/l}$. In group I before treatment, β -endorphin content was $823.74 \pm 14.14 \text{ ng/l}$; the figure after 30-minute treatment increased to $975.09 \pm 17.28 \text{ ng/l}$. The difference was statistically significant with $p < 0.05$. This change was remarkably different with $p < 0.01$ after 7-day treatment when results shown that β -endorphin content increased to $1367.93 \pm 21.32 \text{ ng/l}$. The results also revealed that after treatment of LBP due to DS by electroacupuncture on Jia Ji point L5 combined with the prescription of the Ministry of Health (Procedure no. 24), β -endorphin content in blood increased compared to that after acupuncture prescription without combination with electroacupuncture on Jia Ji point L5. This difference was statistically significant at $p < 0.05$.

Therefore, the increase in β -endorphin content in blood under effect of electroacupuncture contributed to the hypothesis that the anti-pain mechanism of acupuncture was a combination of two mechanisms. They were pain-induced

conduction of the tactile signal and the activation of the body's analgesic system leading to secretion of endogenous opiates. The gradual increase in β -endorphin content in patients; blood at the research times proved the electroacupuncture effect according to neural theory. Electroacupuncture activated the anti-inflammatory system in the body to produce chemical intermediates of the body's anti-pain system, thus leading to clinical pain relief. The data obtained in this study allowed us to acknowledge the neural theory to explain the electroacupuncture effect as a modification of the β -endorphin content.

- General treatment results

The LBP treatment efficacy in our study was evaluated based on three study indicators including pain intensity change, improvement in lumbar spine elasticity and improvement of patients' living function according to the Roland Moris questionnaire.

The results showed that after 7 days of treatment, 98.33% of patients in both treatment groups achieved excellent and good results. Group I had excellent treatment result of 88.33% and good result of 10.0%; the average result was just 1.67%. In group II, there were 58.33% of excellent result; 40.0% of good result and 1.67% of fair result, respectively.

CONCLUSION

Based on the study results, the area, skin temperature and current intensity at Jia Ji point L5 in 180 normal adults and pathological characteristics of acupuncture in 120 LBP patients due to low-cold-state DS along with effect assessment of electroacupuncture on Jia Ji point L5 combine with the prescription of the Ministry of Health (Procedure no. 24) in 60 LBP patients, We have drawn some conclusions as follows:

1. Jia Ji point L5 is located 0.5 inch towards two sides at the below head the spine of lumbar vertebrae, equivalent to 10.90 ± 1.10 mm. Superiorcutaneous acupoint has an area of 12.99 ± 0.49 mm² with the following characteristics: Skin temperature at the acupoint is 32.36 ± 0.60 °C; transcutaneous current intensity is 96.52 ± 7.48 μ A. There was no difference in these indices at the

two sides of the body as well as in the genders ($p > 0.05$). In the age group of 18-29, skin temperature and transcutaneous current intensity was higher than that of in age group of over 40 ($p < 0.05$).

2. At Jia Ji point L5 in LBP patients due to low-cold-state DS in the age of 30-60, skin temperature was $30.27 \pm 0.57^{\circ}\text{C}$ with transcutaneous current intensity of $65.71 \pm 6.28 \mu\text{A}$, which was lower than that of normal adults in the same age ($p < 0.05$).

3. The results of the electroacupuncture on Jia Ji point L5 combined with the prescription of the Ministry of Health (Procedure no. 24) in the treatment of LBP due to low-cold-state DS shown the excellent result of 91.67% and good result of 6.67%, which were higher than those of control group with the excellent result of 66.67% and good result of 30% ($p < 0.05$).

- Improvement of pain intensity compared to that before treatment and compared to that in the control group was statistically significant ($p < 0.05$).

- Increased improvement in lumbar spine elasticity after treatment significantly compared to that before treatment and compared to that in the control group was statistically significant ($p < 0.05$).

- Improvement of the daily function index achieved excellent result of 91.67% and good result of 8.33%. The change was statistically significant with $p < 0.001$, and this improvement was better than that in the control group with $p < 0.01$.

- Change in characteristics of skin temperature and transcutaneous current intensity at Jia Ji point L5 in LBP patients nearly returned to the index of normal adults with $p > 0.05$.

- β -endorphin content in blood increased from $883.97 \pm 15.21\text{ng/l}$ to $1160.391 \pm 18.34\text{ng/l}$ after one-day and increased to $1779.93 \pm 22.56\text{ng/l}$ after 7-day treatment with $p < 0.01$. After one-day and 7-day treatment, this figure was significantly higher than that of the control group ($p < 0.05$).