



# Journal of Acupuncture Research

Journal homepage: <http://www.e-jar.org>

Review Article

## A Review of Acupuncture Treatment Methods for Lumbar Herniated Intervertebral Disc



Sung Jin Kim, Seong Mok Jeong, Chang Hee Lee, Jin-Young Yoon, Sung Eun Shim, Jeong Hyon Kim, Bon Hyuk Goo, Yeon Cheol Park, Yong-Hyun Baek, Sang Soo Nam, Byung-Kwan Seo\*

Department of Acupuncture & Moxibustion Medicine, College of Korean Medicine, Kyung Hee University, Seoul, Korea

### ABSTRACT

#### Article history:

Submitted: September 19, 2018

Revised: October 17, 2018

Accepted: November 2, 2018

#### Keywords:

acupuncture, electroacupuncture, herniated disc, intervertebral disc, traditional medicine

The purpose of this study was to review clinical studies of lumbar herniated intervertebral disc (LHIVD) treatment using acupuncture. Online database (PubMed, COCHRANE Library, EMBASE, CNKI, KISS, NDSL, KoreaMed, KMBase, OASIS, and KISTI) searches were conducted in May 2018. Studies that used acupuncture, electroacupuncture or warm needle acupuncture were included, along with participants who had lower back pain and radiating pain of their lower limbs consistent with radiological findings. Animal studies and nonclinical data were excluded. Data on treatment methods, site, time, frequency, period, and scales used were analyzed. There were 69 studies including 38 randomized controlled trials, 14 retrospective observational studies, and 17 clinical case studies. There were 51 acupoints selected for acupuncture treatment of LHIVD. The most frequently treated acupoints were BL23, BL25, BL24, and BL40. The mean treatment time, frequency, and duration were  $26.06 \pm 6.70$  mins,  $6.29 \pm 1.70$  times/week, and  $20.57 \pm 11.04$  days, respectively, in randomized controlled trials (RCT), and  $18.62 \pm 4.60$  mins,  $11.58 \pm 3.99$  times/week, and  $34.43 \pm 17.62$  days, respectively, in case/retrospective studies (mean $\pm$ SD). This review collates information about acupuncture treatment methods for LHIVD.

<https://doi.org/10.13045/jar.2018.00234>  
pISSN 2586-288X eISSN 2586-2898

©2018 Korean Acupuncture & Moxibustion Medicine Society. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Introduction

Lumbar herniated intervertebral disc (LHIVD) is a disorder in which part of or all of the nucleus herniates to the nerve roots. This is either due to degeneration of the intervertebral disc or external force, and results in the rupture of the fibrous ring. Symptoms include abnormal pain at the level of the affected vertebrae, lower back pain, and radiating pain of lower extremities caused by the neuromuscular stimulation of the herniated nucleus. In severe cases of LHIVD, motor neuron palsy such as foot drop syndrome, and sexual dysfunction may also occur [1].

Treatment of LHIVD can be classified into either surgical or conservative treatments. Only 5% to 10% of patients who complain of pain due to disc herniation require surgery because of failure of conservative treatment. Eighty percent of LHIVD patients experienced good results with non-surgical therapy. Therefore, there is a growing interest in Traditional Korean Medicine (TKM) treatment methods, focusing on conservative treatment [2]. TKM treatment includes acupuncture, moxibustion, herbal medicine,

chuna, and herbal medicine [3]. Acupuncture treatment is based on the basic theories of TKM such as the yin and yang and meridian theories, which certain parts of the body are physically stimulated to cause reaction in the body. It is a typical treatment method of TKM, widely used for pain and paralytic diseases [4].

The purpose of this study was to review clinical studies that focused on acupuncture treatment of LHIVD. Shin et al [5] reported research trends in acupuncture treatment of LHIVD by searching PubMed. However, studies of acupuncture treatment in LHIVD using various databases other than PubMed were insufficient. Therefore, this study aimed to investigate the research trends of acupuncture treatment for LHIVD through assessment of various databases including PubMed. This review aimed to evaluate factors involved in TKM treatment, such as the treatment site, duration, frequency, period and scales. The results from this study may provide useful information to help optimize acupuncture treatment for LHIVD in clinical practice, and provide the basis for designing further research studies to look at clinical practice using acupuncture.

\*Corresponding author.

Department of Acupuncture & Moxibustion Medicine, Kyung Hee University Hospital at Gangdong, 892, Dongnam-ro, Gangdong-gu, Seoul, 134-727, Korea  
E-mail: seohbk@hanmail.net

## Materials and Methods

### Data sources and searches

The following electronic databases were searched from their inception to May 2018: PubMed, Excerpta Medica dataBASE (EMBASE), COCHRANE Library, China National Knowledge Infrastructure (CNKI), Korean Studies Information Service System (KISS), National Digital Science Library (NDSL), KoreaMed, Korean Medical Database (KMBASE), Oriental Medicine Advanced Searching Integrated System (OASIS), and Korea Institute of Science and Technology Information (KISTI).

The search terms were a combination of [diagnosis & treatment]. There are details of each strategy for PubMed, EMBASE, COCHRANE, CNKI, and Korean databases in Appendix 1. The search terms of diagnosis were based on a systematic review of LHIVD [6] and consisted of 'HIVD (herniation of intervertebral disc),' 'HNP (herniated nucleus pulposus),' 'spinal disc herniation,' 'lumbar disc herniation,' 'intervertebral disc displacement,' 'nucleus pulposus hernia,' and 'disc degeneration.' We conducted a search using 'acupuncture' for the treatment term.

### Study selection and exclusion criteria

#### Type of intervention & studies

We selected research that used acupuncture as a main treatment of LHIVD. Studies that used electroacupuncture or warm needle acupuncture were also selected. However, pharmaco-acupuncture and acupotomy were excluded because their treatment mechanisms are distinct from those of acupuncture treatment. Only studies where participants diagnosed with LHIVD, disc bulging, protrusion, extrusion, and sequestration, and classification of LHIVD were included. Studies that were not examining the effect of acupuncture treatment for LHIVD were excluded. We also excluded non-human experimental studies. The research was conducted by each of the following methods of assessment (meta-analysis, systematic review of literature, randomized clinical study, retrospective observational study, and case study). Studies that did not provide clinical data were excluded.

#### Type of participants

Studies which treated patients diagnosed with LHIVD with acupuncture were included. Patients included in this study had lower back pain and radiating pain of lower limbs that were consistent with radiologic findings such as MRI, and CT. In addition, patients who were admitted to hospital or outpatient clinics were both included.

### Data extraction

After removing duplicate studies, 2 independent reviewers conducted the first screening process by reading titles and abstracts of acquired research lists to exclude irrelevant studies. The reviewers read the full text of each article to exclude improper studies. Disagreement between the 2 reviewers was resolved by discussion with other reviewers. Reviewers extracted data from selected research related to the treatment method, site (acupoints or non-acupoints), time/frequency, period, and scales.

### Data analysis

#### Analysis by treatment methods

The studies were analyzed according to treatment method. Treatment methods were classified into acupuncture alone, warm

needle acupuncture alone, electroacupuncture alone, acupuncture and other TKM treatment, acupuncture and other Western medical treatment, electroacupuncture and other TKM treatment, electroacupuncture and other Western medical treatment, warm needle acupuncture and other TKM treatment, and warm needle acupuncture and other Western medical treatment. Treatment sites of acupuncture were classified into acupoints and non-acupoints, and we analyzed which acupoints or which parts of the body were treated. Additionally, the mean and standard deviation of treatment time, frequency, and period were calculated. The analysis of treatment time, frequency, period and usage frequency of acupoints was conducted in RCT studies and case/retrospective studies separately. In addition, the proportion of each treatment method and additional TKM treatment was calculated.

#### Analysis by scales

The scales used for measuring the effect of acupuncture treatment of LHIVD were analyzed.

## Results

### Study selection and description

A total of 2413 articles were acquired and 1,627 articles were screened after duplicates were excluded. In the first screening process, 1,511 articles were excluded for the following reasons: 812 were not LHIVD studies, 99 were non-human experimental studies, 527 studies were about improper treatment, and 72 were review articles. In the second screening process by reading the full text, 47 articles were excluded; 32 were not about the effect of acupuncture treatment, 11 studies were a non-human experimental model, and 4 were review articles. As a result, 69 clinical studies about acupuncture treatment of LHIVD were retained for inclusion in the analysis (Fig. 1). There were 38 randomized controlled trials, 14 retrospective observational studies, and 17 case studies (Table 1).

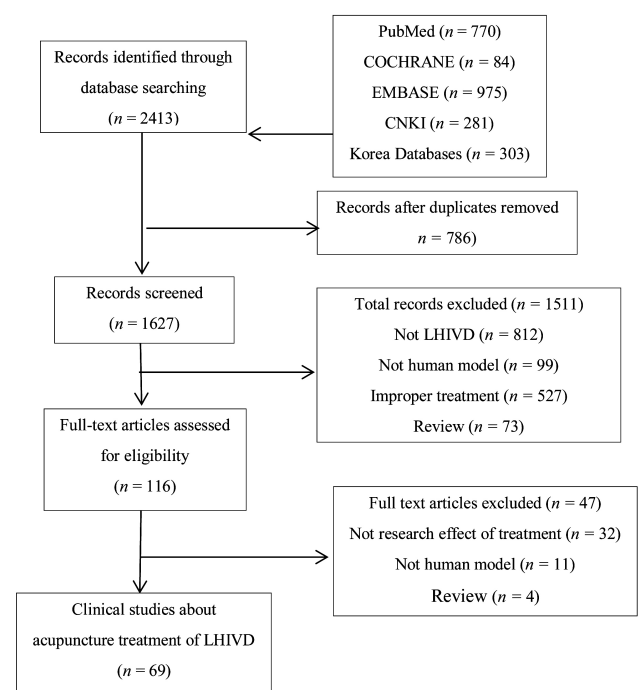


Fig. 1. Flow chart of study inclusion/exclusion criteria. EMBASE, Excerpta Medica dataBASE; CNKI, China national knowledge infrastructure; LHIVD, lumbar herniated intervertebral disc.

Table 1. Characteristics of the Studies Included in This Review.

	Type of study	Treatment method	Treatment site (acupoints/non-acupoints)	Treatment time/frequency/period	Outcome domain (scale)
Xue Z [7] (2018)	RCT	Electroacupuncture	BL25, EX-B2	20 min, 4 times/wk, 28 d	Pain (NRS), Back specific dysfunction (ODI)
EH Tuzun [8] (2017)	RCT	Acupuncture	Non-acupoints (Gleuteus medius, quadratus lumborum, multifidus)	Not recorded, 2 times/wk, 21 d	Pain (VAS, SF-MPQ)
Hu J [9] (2014)	RCT	Acupuncture	BL25, EX-B2, GB30, BL40, GB34, ST36, GB40, BL57	Not recorded, 1 time/d, 10 d	Pain (VAS) Effective rate (GPE)
Hou S [10] (2009)	RCT	Acupuncture	BL25, BL23, GV4, BL26, BL24, GB30, EX-B2, BL56, GB31, GB39, BL40, GB34	30 min, 1 time/d, 10 d	Effective rate (GPE) Pain (PRI)
Ding W [11] (2014)	RCT	Acupuncture	Non-acupoints (Equilibrium Acupuncture)	Not recorded, 1 time/d, 3 d	Effective rate (GPE), Pain (VAS, PRI)
Chen MR [12] (2009)	RCT	Warm needle acupuncture	BL23, BL25, GB30, BL40, BL60	20 min, 1 time/d, 10 d	Effective rate (GPE), Pain (VAS)
Chen XH [13] (2006)	RCT	Electroacupuncture	BL23, BL24, BL25, BL26, GB30, BL37, BL57, BL40, BL60	30 min, 1 time/d, 28 d	Pain (VAS)
Du Z [14] (2009)	RCT	Electroacupuncture	EX-B2	45 min, 3 times/wk, 28 d	Effective rate (GPE), Pain (VAS), Back specific dysfunction (JOA)
Li YQ [15] (2006)	RCT	Acupuncture	BL23, BL25, BL54, BL40, BL54	30 min, 1 time/d, 30 d	Effective rate (GPE), Pain (VAS)
Shan YL [16] (2011)	RCT	Electroacupuncture	EX-B2, BL24, BL26, BL25, BL54, GB34, BL60, SP9	30 min, 1 time/d, 14 d	Effective rate (GPE), Pain (VAS)
Lu W [17] (2002)	RCT	Electroacupuncture	EX-B2	20 min, 1 time/d, 14 d	Pain (VAS)
Fan Y [18] (2009)	RCT	Warm needle acupuncture	BL54, GB30, BL36, BL37, BL40, BL57, BL60	30 min, 1 time/d, 30 d	Effective rate (GPE), Pain (VAS)
Li LX [19] (2006)	RCT	Acupuncture	EX-B2, BL40, BL63, KI3, GB30, GB36	20 min, 1 time/d, 10 d	Effective rate (GPE), Pain (VAS)
Zhang ZH [20] (2004)	RCT	Electroacupuncture	BL23, BL24, BL25, GB30, GB34, BL40, EX-B2	20 min, 1 time/d, 20 d	Effective rate (GPE), Pain (VAS)
Feng H [21] (2012)	RCT	Acupuncture	Non-acupoints (Trigger points, gluteus maximus, multifidus, erector spinae)	15 min, 1 time/3 d, 60 d	Effective rate (GPE), Pain (PRI)
Geng X [22] (2009)	RCT	Electroacupuncture	EX-B2, BL54, GB30, BL40, GB34	30 min, 1 time/d, 20 d	Effective rate (GPE)
Wang XG [23] (2008)	RCT	Warm needle acupuncture	EX-B2, BL54, BL40, GB34	Not recorded, 1 time/d, 14 d	Effective rate (GPE) Pain (PRI)
Wu YC [24] (2004)	RCT	Electroacupuncture	GV3, GB30, EX-B2	20 min, 1 time/d, 20 d	Effective rate (GPE)
Zhang BM [25] (2008)	RCT	Electroacupuncture	EX-B2, GV3, GB30, GB43, GB34, BL37, BL62	20 min, 1 time/d, 20 d	Effective rate (GPE)
Gao H [26] (2007)	RCT	Acupuncture	BL23, BL25, EX-B2, BL54, BL40, BL56, GB30, GB31, GB34, GB39	30 min, 1 time/d, 10 d	Effective rate (GPE), Pain (PPI)
Huang CH [27] (2007)	RCT	Electroacupuncture	BL25, BL26, BL23, BL40, Ashi point, LR13, BL62	30 min, 1 time/d, 10 d	Effective rate (GPE)
Ma LX [28] (2010)	RCT	Electroacupuncture	BL40, GB30, GB34, BL23, EX-B2, BL25, ST36, BL60, LR3	30 min, 1 time/d, 20 d	Effective rate (GPE)
Liu DM [29] (2018)	RCT	Acupuncture + Moxibustion	BL23, BL25, Ashi point, BL26, BL56, BL36, GB31, ST36, GB39, GB40, LR3, BL60	20 min, 1 time/d, 20 d	Effective rate (GPE), Pain (NRS) Back specific dysfunction (JOA)
Jiang JJ [30] (2017)	RCT	Acupuncture + Western medical treatment	BL40, GB43	20 min, 1 time/d, 14 d	Effective rate (GPE), Pain (NRS), Back specific dysfunction (JOA, ODI)
Guo JG [31] (2013)	RCT	Acupuncture + Chuna	Non-acupoints ( Equilibrium Acupuncture)	10 min, 1 time/d, 10 d	Effective rate (GPE), Pain (VAS), Back specific dysfunction (ODI)
He Q [32] (2010)	RCT	Electroacupuncture + Chuna	EX-B2, BL23, BL25, BL40, GB30, GB34, BL60	30 min, 1 time/d, 10 d	Effective rate (GPE), Pain (VAS)

Table 1. (Continued).

	Type of study	Treatment method	Treatment site (acupoints/non-acupoints)	Treatment time/frequency/period	Outcome domain (scale)
Ji XL [33] (2015)	RCT	Acupuncture + Western medical treatment	BL23, BL25, GB30, GB43, BL40, BL56	30 min, 1 time/d, 28 d	Effective rate (GPE), Pain (VAS)
Qu M [34] (2010)	RCT	Electroacupuncture + Western medical treatment	EX-B2, GB30, BL54, GB34, BL37, BL40, BL57, BL60, GB31, GB39, GB40, KI16	30 min, 1 time/2 d, 28 d	Effective rate (GPE), Pain (VAS), Back specific dysfunction (ODI)
Hong DF [35] (2013)	RCT	Acupuncture + Chuna	EX-B2	30 min, 1 time/d, 20 d	Effective rate (GPE)
Chen Y [36] (2010)	RCT	Acupuncture + Chuna	EX-B2, BL54, BL40, BL23	20 min, 1 time/d, 20 d	Back specific dysfunction (JOA), Pain (PRI)
Zhao BX [37] (2008)	RCT	Acupuncture + Chuna	BL23, BL25, BL31, BL32, BL33, BL34, BL54, BL40, KI16, GB37	30 min, 1 time/5 d, 40 d	Back specific dysfunction (JOA) Quality of life (EQ-5D)
Ma S [38] (2010)	RCT	Acupuncture + Moxibustion	BL23, BL25, BL24, BL40, BL56, GB34, GB43	30 min, 1 time/d, 21 d	Effective rate (GPE), Back specific dysfunction (JOA)
Chen RH [39] (2000)	RCT	Acupuncture + Chuna	EX-B2, GB30, GB34, BL36, BL40	30 min, 1 time/d, 20 d	Effective rate (GPE), Pain (PRI)
Fu XS [40] (2011)	RCT	Acupuncture + Chuna	EX-B2, BL23, GV3, BL25, GB30, BL40, GB34, KI3, Ashi point	20 min, 1 time/d, 42 d	Effective rate (GPE)
Hu Y [41] (2013)	RCT	Acupuncture + Chuna	BL23, BL54, GB30, BL36, BL37, BL40, GB31, GB34, BL56	30 min, 1 time/d, 10 d	Effective rate (GPE)
Liu X [42] (2009)	RCT	Warm needle acupuncture + Chuna	EX-B2, BL54, BL32, GB30, BL40, GB34, BL60, ST36	30 min, 1 time/d, Not recorded	Effective rate (GPE)
Xiong J [43] (2013)	RCT	Acupuncture + Chuna	BL22, BL23, BL24, BL25, BL26, BL54, GB30, BL37, BL60	30 min, 1 time/d, 28 d	Effective rate (GPE)
Liu L [44] (2009)	RCT	Electroacupuncture + Herbal medicine	BL25, BL26, BL27, GV3	30 min, 1 time/d, 20 d	Effective rate (GPE)
Kim SJ [45] (2010)	Retrospective	Acupuncture + Herbal medicine	BL23, BL24, BL25, BL52, BL31, BL32, BL33, BL34, GB30	20 min, 2 times/d, 28 d	Effective rate (GPE)
Lee EK [46] (2008)	Retrospective	Acupuncture + Herbal medicine	BL22, BL23, BL24, BL25, BL52, BL31, BL32, BL33, BL34, GB30	20 min, 2 time/d, 20 d	Effective rate (GPE)
Yang MS [47] (2010)	Retrospective	Acupuncture + TKM treatment	BL23, BL52, BL25, GB30, GB34, BL60, KI3, ST36	20 min, 2 time/d, not recorded	Pain (VAS)
Lee EJ [48] (2016)	Retrospective	Acupuncture + TKM treatment	Non-acupoints (Ashi point, Trigger point)	20 min, 2 times/d, 21 d	Pain (VAS)
Oh SK [49] (2005)	Retrospective	Acupuncture + TKM treatment	BL22, BL23, BL24, BL25, EX-B2	5 min, 2 time/d, 30 d	Pain (VAS)
Jang SG [50] (2003)	Retrospective	Acupuncture + Herbal medicine	Non-acupoints (Scalp Acupuncture)	15 min, 2 time/d, 30 d	Effective rate (GPE)
Kim JH [51] (2003)	Retrospective	Acupuncture + TKM treatment	BL23, BL24, BL25, GB30, BL32, BL52	20 min, 1 time/d, 21 d	Pain (VAS)
Youn YS [52] (2008)	Retrospective	Acupuncture + TKM treatment	BL22, BL23, BL24, BL25, BL26, GV3	15 min, 2 time/d, 56 d	Pain (VAS), Quality of life (SF-36) Back specific dysfunction (ODI),
Lee EG [53] (2009)	Retrospective	Acupuncture + TKM treatment	Ashi point, ST36, SP6, LR3	15 min, 2 time/d, 34 d	Pain (VAS)
Kim JS [54] (2015)	Retrospective	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, BL51, BL52, BL40, GB34, BL60, BL62	15 min, 2 times/d, 32 d	Pain (VAS)
Song HG [55] (2009)	Retrospective	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, BL52, GV3, BL40, GB34, BL60, BL56, BL56, GB30, GB34	20 min, 2 times/d, 21 d	Pain (VAS), Back specific dysfunction (ODI)
Lim SS [56] (2016)	Retrospective	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, BL31, BL40, BL52, BL53, GB30, GB34, GB35, GB39, GB40, GB43	15 min, 2 times/d, 21 d	Pain (VAS), Back specific dysfunction (ODI)
Lee SY [57] (2011)	Retrospective	Acupuncture + TKM treatment	BL23, BL52, BL25, Ashi point, BL56, BL56, BL60	20 min, 2 times/wk, 84 d	Pain (VAS), Back specific dysfunction (ODI)
Kym YH [58] (2017)	Retrospective	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, BL56	15 min, 2 times/d, 14 d	Pain (VAS)
Kim HS [59] (2017)	Case study	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, GV3, BL31, BL32, BL33, BL34, GB30, BL54, BL40, ST36, GB34, GB39, BL56, BL56, BL60	15 min, 2 times/d, 40 d	Pain (VAS), Back specific dysfunction (ODI)

Table 1. (Continued).

	Type of study	Treatment method	Treatment site (acupoints/non-acupoints)	Treatment time/frequency/period	Outcome domain (scale)
Kim JY [60] (2006)	Case study	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, GV4, GV3, BL56, GB30, BL36, BL40	15 min, 4 times/wk, 35 d	Pain (VAS)
Song KC [61] (2017)	Case study	Acupuncture + TKM treatment	BL23, BL40, SP6, GB39	20 min, 1 time/d, 35 d	Pain (VAS)
Hong SP [62] (2016)	Case study	Acupuncture + TKM treatment	BL22, BL23, BL24, BL25, BL26, BL27, BL28, BL31, BL32, BL33, BL34, BL53, BL54, EX-B2	20 min, 2 times/d, 19 d	Pain (NRS) Back specific dysfunction (ODI)
Kwon HK [63] (2014)	Case study	Acupuncture + TKM treatment	GV4, GB36, BL23, BL28	20 min, 2 times/d, 13 d	Pain (VAS), Back specific dysfunction (ODI)
Cho HS [64] (2012)	Case study	Acupuncture + TKM treatment	EX-B2, BL22, BL23, BL24, BL25	20 min, 1 time/d, 40 d	Pain (VAS), Back specific dysfunction (ODI)
Kim JH [65] (2011)	Case study	Acupuncture + TKM treatment	BL23, BL25, GV3, BL40	15 min, 1 time/d, 37 d	Pain (VAS)
Lee BH [66] (2001)	Case study	Acupuncture + TKM treatment	BL23, BL24, BL25, BL26, GB30, BL32, ST36, BL40, SP6	20 min, 1 time/d, 45 d	Pain (VAS)
Rhee SH [67] (2006)	Case study	Acupuncture + TKM treatment	BL22, BL23, BL24, BL25, EX-B2, GB30, BL40, BL65, GB34	20 min, 2 time/d, 12 d	Pain (VAS)
Kim SJ [68] (2006)	Case study	Acupuncture + TKM treatment	Non-acupoints (Quadratus lumborum, Erector spinae, Gluteus maximus, Gluteus medius, piriformis)	30 min, 2 times/d, 30 d	Pain (VAS)
Lim GM [69] (2011)	Case study	Acupuncture + TKM treatment	BL23, BL52, BL24, BL25, BL26, GV3, Ashi point, SI3, TE3, GB30, BL40, GB34, BL56, BL56, BL60, GB41	20 min, 2 time/d, 42 d	Pain (VAS, SF-MPQ) Back specific dysfunction (ODI)
Park HH [70] (2008)	Case study	Acupuncture + Herbal medicine	BL40, GB34, ST36, GB39	30 min, 1 time/d, 20 d	Pain (VAS)
Kim JY [71] (2010)	Case study	Acupuncture + TKM treatment	BL22, BL23, BL24, BL25, BL26, SP9, ST36, BL67	20 min, 2 times/d, 28 d	Pain (VAS)
Kang JH [72] (2004)	Case study	Acupuncture + Herbal medicine	BL22, BL23, BL24, BL25, BL26, GV4, GV3, BL40, GB30, BL56, GB31, ST36, GB39, GB40	20 min, 2 times/d, 47 d	Pain (VAS)
You KG [73] (2011)	Case study	Acupuncture + TKM treatment	EX-B2, Ashi point	20 min, 2 times/d, 84 d	Pain (VAS)
Kim SN [74] (2005)	Case study	Acupuncture + TKM treatment	CV3, CV2, CV6, CV4, SP6, SP9, CV1, BL31, BL32, BL33, BL34	20 min, 2 time/d, 49 d	Pain (VAS)
Hwang GT [75] (2005)	Case study	Acupuncture + TKM treatment	BL25, BL23, GB30, Ashi point, SI3, BL60	20 min, 3 times/wk, 45 d	Pain (VAS)

GPE, global perceived effect; NRS, numerical rating scale; VAS, visual analogue scale; ODI, Oswestry disability index; JOA, Japanese orthopedic association; SF-MPQ, short form McGill pain questionnaire; SF-36, short form health survey 36; PRI, pain rating index; EQ-5D, EuroQOL-5 dimensions; PPI, present pain intensity.

### Treatment methods

Treatment methods were classified into acupuncture alone, warm needle acupuncture alone, electroacupuncture alone, acupuncture and other TKM treatment, electroacupuncture and other Western medical treatment, electro-acupuncture and other TKM treatment, electroacupuncture and other Western medical treatment, warm needle acupuncture and other TKM treatment, and warm needle acupuncture and other Western medical treatment.

Among the 69 studies analyzed, there were 8 studies examining the effect of acupuncture treatment alone, 11 on electroacupuncture alone, 3 studies about warm needle acupuncture alone, 41 studies about acupuncture and other TKM treatment, 2 studies about acupuncture and other Western medical treatment, 2 studies about electroacupuncture and other TKM treatment, 1 study about electroacupuncture and other Western medical treatment, and 1 study about warm needle acupuncture and other TKM treatment (Table 2). There were 44 studies that used TKM treatment as an

Table 2. Treatment Methods of Acupuncture for LHIVD.

Treatment	N (%)
Acupuncture	8 (11.6)
Electroacupuncture	11 (15.9)
Warm needle acupuncture	3 (4.4)
Acupuncture + TKM treatment	41 (59.4)
Acupuncture + Western medical treatment	2 (2.9)
Electroacupuncture + TKM treatment	2 (2.9)
Electroacupuncture + Western medical treatment	1 (1.5)
Warm needle acupuncture + TKM treatment	1 (1.5)
Warm needle acupuncture + Western medical treatment	0
Total	69

LHIVD, lumbar herniated intervertebral disc; TKM, traditional Korean medicine.

Table 3. TKM Treatment Used in Addition to Acupuncture.

TKM	N (%)
Moxibustion	2 (4.5)
Chuna	10 (22.7)
Herbal medicine	6 (13.6)
Complex TKM treatment	26 (59.1)
Total	44 (100)

TKM, traditional Korean medicine.

additional treatment to acupuncture. Among them, 2 studies used moxibustion alone, 10 studies used chuna therapy alone, 6 studies used herbal medicine alone as an additional treatment, and 26 studies used complex TKM treatments including bee venom acupuncture, pharmacopuncture, moxibustion, herbal medicine, chuna, bloodletting therapy, and fumigation (Table 3). Traction, ozone injection, laser needle knife, and nerve block were used as Western medical treatments in addition to the acupuncture treatment.

#### Treatment site

##### Acupoints

There were 62 studies that used acupoints as the treatment site. A total of 51 acupoints were selected for acupuncture treatment of LHIVD. BL40, EX-B2, GB30, BL25 and BL23 were the most frequently used acupoints in RCT studies. BL23, BL25, BL24, GB30, and BL40 were the most frequently treated acupoints in case/retrospective studies (Tables 5,6).

##### Non-acupoints

There were 7 studies that used non-acupoints. Muscles and trigger points were used as the treatment site in 4 studies. These studies treated the soft tissue around the spine and painful area based on anatomical position without mentioning acupuncture points. The gluteus maximus, gluteus medius, quadratus lumborum, multifidus, and erector spinae were treated with acupuncture. Two studies treated LHIVD with equilibrium acupuncture and 1 study examined the effect of scalp acupuncture in treating LHIVD.

#### Treatment time, frequency, and period

For the time of acupuncture treatment, the mean treatment duration was  $26.06 \pm 6.70$  mins in RCT studies and  $18.62 \pm 4.60$  mins in case/retrospective studies (mean $\pm$ SD). The treatment duration of treatment groups ranged from a minimum of 5 mins to a maximum of 45 mins (Figs. 2,3). The mean frequency of acupuncture treatment was  $6.29 \pm 1.70$  times/week in RCT studies and  $11.58 \pm 3.99$  times/week (mean $\pm$ SD) in case/retrospective studies (Figs. 4,5). The treated period ranged from 3 to 84 days, with an average of  $20.57 \pm 11.04$  days in RCT studies, and  $34.43 \pm 17.62$  days in case/retrospective studies (Figs. 6,7).

#### Outcome domains and scales

Effective rate, back specific dysfunction, and quality of life were used to measure outcome. Pain was the most frequently used outcome parameter (52 times). VAS (Visual Analogue Scale)

Table 4. Acupoints Used to Treat LHIVD in RCT Studies.

Acupoints	N
BL40	24
EX-B2	21
GB30	20
BL25	19
BL23	17
GB34	16
BL54	13
BL60	10
BL26	7
BL24	6
BL56	6
BL37	6
GB31	5
ST36	4
GV3	4
BL57	4
Ashi point	3
GB40	3
BL32	2
LR3	2
KI3	2
BL62	2
KI16	2
BL22	1
BL31	1
BL33	1
BL34	1
GV4	1
SP9	1
GB36	1
BL27	1
LR13	1
BL63	1
GB37	1

LHIVD, lumbar herniated intervertebral disc; RCT, randomized controlled trials.

Table 5. Acupoints Used to Treat LHIVD in Case Studies and Retrospective Studies.

Acupoints	N
BL23	24
BL25	22
BL24	18
GB30	13
BL40	12
BL26	12
BL56	11
GB34	9
GB39	9
BL52	9
BL22	8
BL60	7
ST36	7
GV3	7
BL32	7
Ashi point	6
BL31	6
EX-B2	5
BL33	5
BL34	5
SP6	4
GV4	3
BL54	2
GB40	2
SP9	2
SI3	2
BL53	2
BL28	2
GB31	1
LR3	1
KI3	1
BL62	1
GB36	1
BL27	1
CV1	1
BL51	1
BL67	1
TE3	1
CV3	1
GB41	1
GB35	1
BL65	1
CV6	1
CV4	1
CV2	1

LHIVD, lumbar herniated intervertebral disc

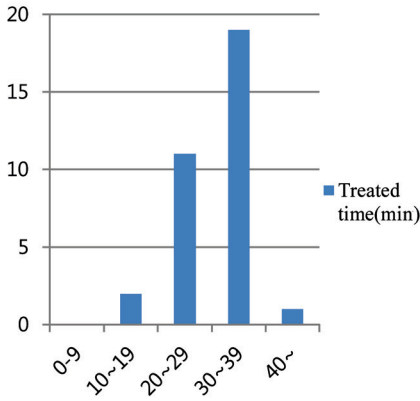


Fig. 2. Duration of treatment time in RCT studies. RCT, randomized controlled trial.

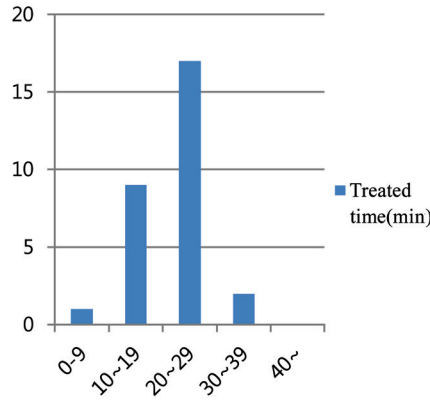


Fig. 3. Duration of treatment time in case studies and retrospective studies.

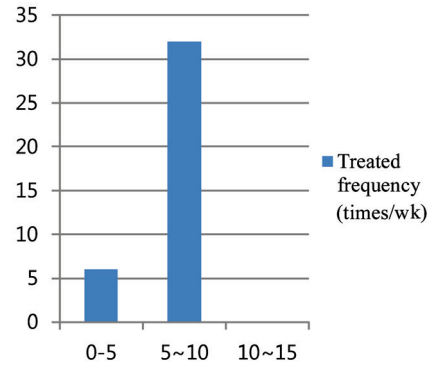


Fig. 4. Frequency of treatment in RCT studies. RCT, randomized controlled trial.

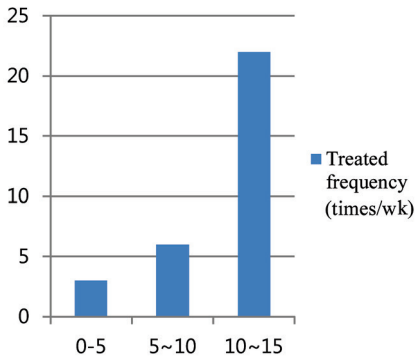


Fig. 5. Frequency of treatment in case studies and retrospective studies.

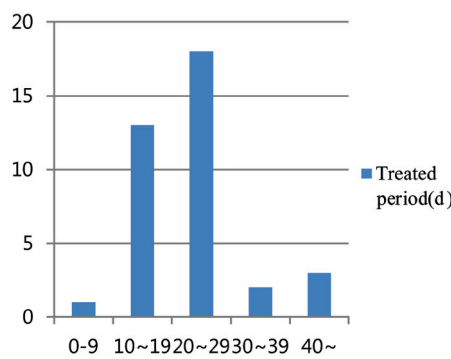


Fig. 6. Duration of treatment period in RCT studies. RCT, randomized controlled trial.

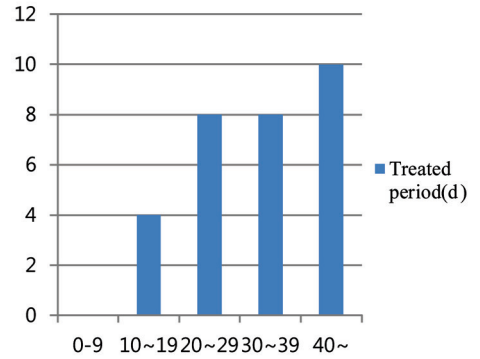


Fig. 7. Duration of treatment period in case studies and retrospective studies.

was the most frequently used scale to measure pain (43 times). PRI (Pain Rating Index), NRS (Numerical Rating Scale), SF-MPQ (Short Form McGill Pain Questionnaire), PPI (Present Pain Intensity) were also used as scales to evaluate the pain intensity. Effective rate was the next most frequently used outcome measurement (35 times). GPE (Global Perceived Effect) was used to measure the effective rate after the acupuncture treatment. Back specific dysfunction was used to measure outcome on 18 occasions. ODI (Oswestry Disability Index) and JOA (Japanese Orthopedic Association) were used as scales to evaluate back specific dysfunction. Quality of life was used as an outcome measurement twice. SF-36 (Short Form Health Survey 36) and EQ-5D (EuroQOL-5 Dimensions) were used as scales to assess quality of life (Table 6).

**Discussion**

Acupuncture has been an effective treatment method in TKM for many years. There have been many studies investigating factors that can influence the treatment effect of acupuncture. Treatment site, time, frequency, and duration have been thought to be important contributing factors influencing the effect of acupuncture treatment [77], and studies are being conducted to determine the influence of these factors. In this study, an investigation was

Table 6. Outcome Domains and Scales Used to Evaluate Treatment Effect.

Outcome domains	Study Number	Scales (N)
Pain	52	VAS (43), PRI (6), NRS (4), SF-MPQ (2), PPI (1)
Effective rate	35	GPE (35)
Back specific dysfunction	18	ODI (13), JOA scale (6),
Quality of life	13	EQ-5D (1), SF-36 (1)

GPE, global perceived effect; NRS, numerical rating scale; VAS, visual analogue scale; ODI, Oswestry disability index; JOA, Japanese orthopedic association; SF-MPQ, short form McGill pain questionnaire; SF-36, short form health survey 36; PRI, pain rating index; EQ-5D, EuroQOL-5 dimensions; PPI, present pain intensity.

conducted to examine these acupuncture treatment methods for LHIVD, with the aim of providing information to determine the treatment methods in clinical practice or designing further clinical research on acupuncture treatment for LHIVD.

The analysis of treatment site showed that acupoints located in the waist such as BL23, BL24, BL25, and GB30, were frequently used in both RCT studies and case/retrospective studies. BL40

which is in other parts of the body, such as the legs or hips, were also frequently used.

There are 2 ways of selecting acupoints based on the distance from the lesion, either by treating local acupoints or distal acupoints. Local acupoints are those points near to the painful sites, whilst distal acupoints are those located further away [78]. Local acupoints are usually used to treat musculoskeletal pain and pain due to trigger points, and tender points that are painful on pressure, through peripheral mechanisms such as vasodilation and segmental inhibition [79]. Nanna et al [80] revealed the anti-nociceptive effect of local acupoints in the treatment of musculoskeletal pain. It was proposed that the pain relief mechanism resulted from inhibition of the adenosine binding to the adenosine A1 receptor in the proximal rather than the central pathway. As shown in this study, most of the RCT and case/retrospective studies used the local acupoints like BL23, BL24, BL25, and GB30, mainly to treat lower back pain caused by LHIVD.

There are studies examining the effects of different duration of needle retention during acupuncture treatment. Cui et al [81] investigated the effect of different retaining needle time on pain threshold, and concluded that 25-30 mins of retaining time was the most effective in pain control. In addition, adenosine, a neuromodulator with anti-nociceptive properties, was released and an analgesic effect was strongest when the retaining needle time was 30 mins [82]. The treatment duration was different between RCT studies and case/retrospective studies. The mean treatment duration was  $26.06 \pm 6.70$  mins in RCT studies and  $18.62 \pm 4.60$  mins in case/retrospective studies (mean $\pm$ SD). The reason for this difference may be explained by differences in retaining time. To obtain the best therapeutic effect for treating patients, at least more than 25 mins, and ideally 30 mins of retaining needle time, appeared to provide the best therapeutic benefit. However, there are practical concerns to consider such as manpower and cost in the clinical practice. In the process of satisfying these factors, retaining needle time would have been modulated.

The North American Spine Society recommends conservative treatment for LHIVD for 6 weeks before considering surgical treatment [82]. The results from this analysis suggest that 6 weeks of treatment period would be efficient for treating LHIVD with acupuncture in clinical practice. The treatment duration appeared to be different between RCT studies and case/retrospective studies, with an average of  $20.57 \pm 11.04$  days in RCT studies and  $34.43 \pm 17.62$  days in case/retrospective studies. The reason for this difference seems to be the differences in the type of participants. In every case/retrospective study, the patients treated by acupuncture were those who were admitted to the TKM hospital. In contrast, almost all the RCT studies were conducted in the outpatients department. Acupuncture treatment would have to be conducted for longer periods in patients who were admitted to obtain optimal therapeutic effect, but there are many obstacles such as cost, and loss of patients when conducting long-term follow-up studies. So, considering factors like treatment effect, cost, and possibility of patient loss, it may be better if the treatment period in RCT studies were designed to be shorter than in case/retrospective studies.

In summary, this process will provide more information to help TKM practitioners to decide the appropriate treatment methods for clinical practice, or for designing clinical research studies.

The limitation of this study is that the search database was limited to specific databases and did not cover all the studies. Several studies have been written in Japanese or in other languages regarding the treatment methods of acupuncture used for treating LHIVD. Therefore, it is difficult to conclude that all the research trends of acupuncture treatment for LHIVD are

included in this study, as the number of final retrieved documents is small. Additionally, the process of evaluating the quality of searched studies was not conducted and the treatment effects of acupuncture or risk of bias of studies were not evaluated. Retaining a larger number of studies through searching more databases and improving the processes of analyzing the risk of bias and comparative analysis of treatment effects are necessary to provide more evidence for treating LHIVD with acupuncture treatment in clinical practice.

## Conclusion

A total of 69 studies were selected based on the search strategies set out in this study. There were 38 randomized controlled trials, 14 retrospective observational studies, and 17 clinical case studies. The results of the analysis are as follows.

1. Treatment methods were classified as acupuncture treatment alone, electro-acupuncture alone, warm needle acupuncture alone, acupuncture and other TKM treatment, acupuncture and other Western medical treatment, electroacupuncture and other TKM treatment, electroacupuncture and other Western medical treatment, warm needle acupuncture and other TKM treatment, and warm needle acupuncture and other Western medical treatment. A combination of acupuncture and TKM treatments used as additional treatment were most frequently used.

2. BL23, BL25, BL24, and BL40 were the most frequently treated acupoints. Mean of treatment time, frequency, and duration were  $26.06 \pm 6.70$  mins,  $6.29 \pm 1.70$  times/week, and  $20.57 \pm 11.04$  days, respectively, in RCT studies, and  $18.62 \pm 4.60$  mins,  $11.58 \pm 3.99$  times/week, and  $34.43 \pm 17.62$  days, respectively, in case/retrospective studies (mean $\pm$ SD).

3. Pain, Effective rate, back specific dysfunction, and quality of life were used as outcome measurements. Pain was the most frequently used outcome parameter. VAS, PRI, NRS, SF-MPQ, PPI, GPE, ODI, JOA, and SF-36 were used as scales for evaluating outcome measurements. (Table 6).

## Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

## Acknowledgments

This study was supported by the TKM R&D program, which is funded by the Ministry of Health and Welfare through the Korea Health Industry Development Institute (HB16C0061).

## References

- [1] Suk SI, Lee CK, Baek GH, Song KS, Lee MC, Lee HM et al. Orthopedics, 7th ed. Seoul (Korea): Choisin publishers Co.; 2013. p. 869-874. [in Korean].
- [2] Lee EJ, Choi JJ, Jang ES, Park YC, Jung IC. Effects of Shinchubogun-tang and Common Korean Medicine Treatment on Symptom Reduction in Patients with Intervertebral Lumbar Disc Herniation: A Retrospective Observational Study. *Physiol Pathol Korean Med* 2016;30:66-72. [in Korean].
- [3] Song BG. Study on the Conservative Treatment of Herniated Lumbar Intervertebral Disc. *J Korean Orient Med Soc* 1995;16:62-78. [in Korean].
- [4] Korean Acupuncture & Moxibustion Medicine Society. The Acupuncture and Moxibustion Medicine. Gyeonggi (Korea): Jipmoondang; 2012. p. 76-136. [in Korean].
- [5] Shin WS, Park WH, Cha YY. The Research Trends on the Acupuncture Treatment of Lumbar Herniated Intervertebral Disc Using PubMed Database. *J Korean Med Rehabil* 2014;24:49-60. [in Korean].
- [6] Van Der Windt, Simons E, Riphagen II, Ammendolia C, Verhagen AP, Laslett M et al. Physical examination for lumbar radiculopathy due to disc



- herniation in patients with low-back pain. *Cochrane Database Syst Rev* 2010;17:CD007431.
- [7] Xue Z, Yang W, Zhao W, Chao W, Wentao D, Zhishum L. A Randomized Clinical Trial Comparing the Effectiveness of Electroacupuncture versus Medium-Frequency Electro therapy for Discogenic Sciatica. *Evid Based Complement Alternat Med* 2017;2017:9502718.
  - [8] Tuzun EH, Sila G, Ender A, Bursa HT, Kezban OD, Mehtap M. Effectiveness of dry needling versus a classical physiotherapy program in patients with chronic low-back pain: a single-blind, randomized, controlled trial. *J Phys Ther Sci* 2017;29:1502-1509.
  - [9] Hu J. Clinical analysis of pain resulted from lumbar intervertebral disc protrusion treated using acupuncture. *Neimenggu J Tradit Chin Med* 2014;24:68-69. [in Chinese].
  - [10] Hou S, Feng L, Wang L. Observation of 30 cases of lumbar intervertebral disc protrusion treated using warm acupuncture combined with western medicine. *Hebei J Tradit Chin Med* 2009;31:588-589. [in Chinese].
  - [11] Ding W. Observation of 75 cases of protrusion of lumbar intervertebral disc treated using balancing acupuncture. *Mod Chin Med* 2014;34:48-50. [in Chinese].
  - [12] Chen MR, Wang P, Cehng G, Guo X, Wei GW, Cheng XH. The Warming Acupuncture for Treatment of Sciatica in 30 cases. *J Tradit Chin Med* 2009;29:50-53. [in Chinese].
  - [13] Chen H, Huang J, Liu J. Effect of electroacupuncture on the rehabilitation of patients with lumbar disc herniation to sciatica. *J Tradit Chin Med* 2006;13:81. [in Chinese].
  - [14] Du Z, Shao P, He Y. Clinical Observation on 32 Cases of Lumbar Intervertebral Disc Herniation Treated by Electro-acupuncture on Huatuo Jiaji Points. *J Tradit Chin Med* 2009;50:617-619. [in Chinese].
  - [15] Li YQ, Liu YQ. Therapeutic effect of acupuncture on postoperative recovery of prolapse of lumbar intervertebral disc. *Zhongguo Zhen Jiu* 2006;26:566-568. [in Chinese].
  - [16] Shan YL. Observation on therapeutic effect of electroacupuncture at Jiaji (EX-B 2) and points of Bladder Meridian mainly for lumbar disc herniation. *Zhongguo Zhen Jiu* 2011;31:987-990. [in Chinese].
  - [17] Lu W. Clinical study on treatment of lumbar vertebral disc herniation with lumbar du channel electrical acupuncture. *Zhongguo Lin Chuang Kang Fu* 2002;6:1164-1165. [in Chinese].
  - [18] Fan Y, Xue LF, Meng XF. Effect analysis of warming acupuncture treatment on lumbar intervertebral disc herniation. *Chin Med Mod Distance Educ China* 2009;7:114-115. [in Chinese].
  - [19] Li LX. Therapeutic effect of electroacupuncture on lumbar disc herniation. *Journal of Chinese Alternative medicine* 2006;22:36-37. [in Chinese].
  - [20] Zhang ZH, Fan J, Qi Z. The clinical and neuroelectrophysiological study of electronic acupuncture on acute lumbar disc herniation. *Zhongguo Lin Chuang Kang Fu* 2004;19:647-649. [in Chinese].
  - [21] Feng H, Zhang YF, Ding M. Analysis of therapeutic effect of lower limb sensation disorder after lumbar disc herniation operation treated with plum-blossom needle along meridians. *Zhongguo Zhen Jiu* 2012;32:129-132. [in Chinese].
  - [22] Geng X. Clinical Observation on 56 Cases of Lumbar Disc Herniation Treated with Electroacupuncture at Jiaji Points and Traction. *Shanxi J Tradit Chin Med* 2009;25:36-37. [in Chinese].
  - [23] Wang XG. Clinical analysis of acupuncture therapy for 52 cases of lumbar disc herniation. *Asia Pac Tradit Med* 2008;4:39-40. [in Chinese].
  - [24] Wu YC, Zhang BR. Clinical observation on Electroacupuncture treatment of Lumbar Intervertebral disc protrusion. *Shanghai J Acu-mox* 2004;23:15-17. [in Chinese].
  - [25] Zhang BM, Wu YC, Shao P, Shen J, Jin RF. Electro-acupuncture therapy for lumbar intervertebral disc protrusion: a randomized controlled study. *Journal of Clinical Rehabilitative Tissue Engineering Research* 2008;12:353-355. [in Chinese].
  - [26] Gao H, Zhu H. Clinical Observation on 120 Cases of Lumbar Disc Herniation Treated with Acupuncture and Moxibustion. *Mod Med J China* 2007;9:71. [in Chinese].
  - [27] Huang CH, Xue X. Therapeutic effect of acupuncture on lumbar disc herniation. *Chin J Misdiagn* 2007;7:745-746. [in Chinese].
  - [28] Ma LX. Clinical Observation on 106 Cases of Lumbar Disc Herniation Treated with Acupuncture. *Chin Foreign Med Treatment* 2010;12:33. [in Chinese].
  - [29] Liu DM. Rehabilitation effect of acupuncture physiotherapy in patients with lumbar disc herniation. *Contemp Med* 2018;24:89-91. [in Chinese].
  - [30] Jiang JJ, Chen SJ, Huang GF. Clinical Observations on Acupuncture plus Lumbar Vertebra-stabilizing Muscle Group Training for Treatment of Lumbar Intervertebral Disc Herniation. *Shanghai J Acu-mox* 2017;36:1463-1465. [in Chinese].
  - [31] Guo JG, Liu Y, Chen BQ, Hu DM, Li YF, Liao HL. Clinical research of balance acupuncture combined with Long's bonesetting massage treating lumbar disc herniation. *China Mod Med* 2013;20:110-112. [in Chinese].
  - [32] He Q, Xu LH, Wu WF, Huang ZH, Wu CR, Li J. Clinical Observation on acupuncture combined with massage for treatment of lumbar intervertebral disc protrusion. *J Guangzhou Uni Tradit Chin Med* 2010;27:242-245. [in Chinese].
  - [33] Ji XL, Li D, Cheng T. Comparison of therapeutic effects in treating lumbar disc herniation in prone traction combined with acupuncture and supine traction. *J Basic Chin Med* 2015;21:1043-1045. [in Chinese].
  - [34] Qu M, Ding XN, Liu HB, Liu YQ. Clinical observation on acupuncture combined with nerve block for treatment of lumbar disc herniation. *Zhongguo Zhen Jiu* 2010;30:633-636. [in Chinese].
  - [35] Hong DF. Effect of acupuncture at the waist and Jiaji points combined with four-finger push-spin adjustment on pain index in patients with lumbar disc herniation. *J Emerg Tradit Chin Med* 2013;22:318-319. [in Chinese].
  - [36] Chen Y, Ran QF. Therapeutic effect of massage combined with acupuncture on lumbar disc herniation. *Beijing J Tradit Chin Med* 2010;29:543-544. [in Chinese].
  - [37] Zhao BX, Wang KZ, Zhao JX, Wang CS, Huang XH, Ma SQ et al. Clinical Effects of Acupuncture after Surgical Operation in Patients with Prolapse of the Lumbar Intervertebral Disc. *J Tradit Chin Med* 2008;28:250-4. [in Chinese].
  - [38] Ma S, Ma J, Pan JN, Zhang XS. Comparative research of lumbar disc herniation treated with acupuncture and snake moxibustion. *Zhongguo Zhen Jiu* 2010;30:563-566. [in Chinese].
  - [39] Chen RH, Chen SR. Therapeutic effect of acupuncture and massage on lumbar disc herniation. *Mod Rehabil* 2000;4:766. [in Chinese].
  - [40] Fu XS. Comparative study on the efficacy of 240 cases of lumbar disc herniation treated with acupuncture and Chinese massage. *World J Integr Tradit West Med* 2011;6:1058-1060. [in Chinese].
  - [41] Hu Y. Comparison of Curative Effect Observation of Acupuncture Add Massage Manipulation with Traction and Manipulation of Massage with Traction on Treating Prolapse of Lumbar Intervertebral Disc. *J Sichuan Tradit Chin Med* 2013;31:137-139. [in Chinese].
  - [42] Liu X. Clinical Observation on Treatment of Lumbar Disc Herniation with Warm Acupuncture and Moxibustion. *Mod J Int Tradit Chin West Med* 2009;18:641-658. [in Chinese].
  - [43] Xiong J, Fang JP, Chen X, Jiang LY, Zhou DY. Clinical evaluation of three different treatments: acupuncture, single massage, acupuncture combined with massage for lumbar disc herniation. *Guide Chin Med* 2013;11:300-301. [in Chinese].
  - [44] Liu L, Liu LG, Lv M, Ran WJ. Observation on therapeutic effect of electroacupuncture combined with chinese herbs for treatment of prolapse of lumbar intervertebral disc of yang deficiency and cold coagulation type. *Zhongguo Zhen Jiu* 2009;29:626-628. [in Chinese].
  - [45] Kim SJ, Lee H. The Clinical Study on 193 Cases with Herniated Lumbar Disc. *J Haehwa Med* 2010;19:119-128. [in Korean].
  - [46] Lee EK, Choi EH, Lee JE, Jeon JH, Lee SH, Lee JM et al. The Clinical study on 137 Cases of Herniated Lumbar Disc Patients. *J Korean Acupunct Moxib Soc* 2008;25:127-138. [in Korean].
  - [47] Yang MS, Kang DH, Ki YB, Park SG, Cho HG, Choi JB et al. Effects of Treatment of Oriental Medicine and Sling Exercise Therapy on Herniated Lumbar Intervertebral Disc. *Korean J Acupunct* 2010;27:5-13. [in Korean].
  - [48] Lee EJ, Choi JJ, Jang E, Park YC, Jung IC. Effects of Shinchubogun-tang and Common Korean Medicine Treatment on Symptom Reduction in Patients with Intervertebral Lumbar Disc Herniation: A Retrospective Observational Study. *J Physiol Pathol Korean Med* 2016;30:66-72. [in Korean].
  - [49] Oh SK. The Clinical Study on the Effect of Conservative Treatment for Patients with Herniated Intervertebral Disc of Lumbar Spine. *J Korea CHUNA Man Med* 2005; 6:41-50. [in Korean].
  - [50] Jang SG, Kim YW, Kang JH, Kim JH, Yim YK, Lee H et al. A Clinical Report on 30 Cases with HIVD by Scalp Acupuncture. *Korean J Acupunct* 2003;20:252-260. [in Korean].
  - [51] Kim JH, Cho MR, Chae WS. The Clinical effects of chuna treatment for HNP. *Korean J Acupunct* 2003;20:229-237. [in Korean].
  - [52] Youn YS, Park WS, Ha IH, Lee JS, Shin HD. A Clinical Study on the Effect of Korean Medical Treatments for Patients with Lumbar Disc Herniation. *J Oreint Rehabil Med* 2008;18:153-161. [in Korean].
  - [53] Lee EG, Moon SJ, Ko YS, Park TY, Kong JC, Pi CS et al. Effectiveness of Oriental Medical Treatments to Symptoms and Quality of Life in the

- Patients with Herniated Lumbar Disc being Suggested Operation. *J Orient Rehabil Med* 2009;19:165-173. [in Korean].
- [54] Kim JS, Kim YJ, Hong JR, Kim MC, Park HS, Kim SY et al. Effects of Integrative Korean Medical Treatment for a Failed Epidural Steroid Injections to L-spine Disk Herniation: A Retrospective Case Series. *Acupunct* 2015;32:203-211. [in Korean].
- [55] Song HG, Choi JY, Kang JH, Lee H. The Effect of the Acupuncture Therapy in Combination with Soyeom Pharmacopuncture Therapy on the Improvement of the Symptoms of the Patients with Herniated Intervertebral Disk of L-spine in His Initial Stage of Hospitalization. *J Pharmacopuncture* 2009;12:111-118. [in Korean].
- [56] Lim SS, Sung HE, Lee CK, Choi HY, Roh JD, Lee EJ. The Effect of Thread Embedding Acupuncture on Lumbar Herniated Intervertebral Disc Patients: A Retrospective Study. *Acupunct* 2016;33:39-47. [in Korean].
- [57] Lee SY, Cheong PS, Han SH, Hwang CH, Yoon YJ, Kim HS et al. 10 Cases of Patients with Lumbar Disc Herniation Improved after Oriental Intensive Therapy. *Korean J Orient Physiol Pathol* 2011;25:702-707. [in Korean].
- [58] Kim YH, Lee JM, Lee EJ, Oh MS. Effects of Daoyin Exercise Therapy Combined with Korean Medicine Treatment on the Pain and Function Improvement of Low Back Pain Patients Diagnosed with Lumbar Disc Herniation: A Retrospective Observational Study. *J Physiol Pathol Korean Med* 2017;31:238-245. [in Korean].
- [59] Kim HS, Kim SY, Kim HJ, Kim ES, Kim YI. The Effect of Acupotomy on Lumbar Herniated Intervertebral Disc: Report of a Case Series. *Acupunct* 2015;32:185-195. [in Korean].
- [60] Kim JY, Lee H. Clinical study on 3 cases of HIVD patients recommended to a operation. *J Haehwa Med* 2006;15:53-58. [in Korean].
- [61] Song KC, Seo JY, Song SB, Cho MU, Monn HY, Kwon KJ et al. A Case Report of Nocturnal pain in Patients Diagnosed with HIVD of L-spine Treated by Samul-tang (Siwu-tang) Gagam and Chuna Manual Treatment. *J Korean Chuna Man Med Spine Nerves* 2017;12:43-52. [in Korean].
- [62] Hong SP, Bae JM, Kim DH, Yang GY, Lee BR. The Effect of Korean Medicine with Needle-embedding Therapy on a Lumbar Herniated Intervertebral Disc: A Case Report. *Acupunct* 2016;33:219-224. [in Korean].
- [63] Kwon HK, Park SA, Ahn CB. The Case study on 1 case of patients with Ruptured Intervertebral Lumbar Disc, treated with Korean medicine. *J East West Med* 2014;39:21-32. [in Korean].
- [64] Cho HS. A Case Report of HNP at L-spine during Pregnancy. *J Korean Med Obstet Gynecol* 2012;25:161-170. [in Korean].
- [65] Kim JH, Lee SM, Shin WY, Choi YJ, Kim SJ, Jun TY et al. A Clinical Case Study of Patient that Not Improved Foot Drop After Herniated Intervertebral Lumbar Disc Surgery. *J Korean Acupunct Moxib Soc* 2011;28:173-181. [in Korean].
- [66] Lee BH, Kim CH, Seo JC, Youn HM, Jang KJ, Song CH et al. A Case of The Reduction of Symptoms, But No Change on The CT Scanning in HNP by Oriental Medical Treatment Added Mori cortex-Bee Venom Acupuncture. *J Pharmacopuncture* 2001;4:17-25. [in Korean].
- [67] Rhee SH, Cho TY, Jin SS, Park JS, Yeo HS, Lim HH. The Case Report about Herniation of Inter-Vertebral Disc Treated with Bee Venom Acupuncture Therapy. *J Korean Chuna Man Med Spine Nerves* 2006;1:73-81. [in Korean].
- [68] Kim SJ, Min BK, Yoon IJ, Oh MS. A Case Report on the Thoracic & Lumbar Disc and Scoliosis Treated by Flexion-Distraction Technique. *J Korean Chuna Man Med Spine Nerves* 2006;1:73-80. [in Korean].
- [69] Lim GM, Moon SJ, Jun KS, Shin HK, Ko YS. A Clinical Case of Oriental Medical Treatment on Failed Back Surgery Syndrome. *J Korean Chuna Man Med Spine Nerves* 2011;6:23-32. [in Korean].
- [70] Park HH, Jung JE, Jung WH, Kim MC. A Clinical Study of Foot Drop Patient with Herniated Intervertebral Lumbar Disc treated by Chuna & General Oriental Therapy. *J Korean Chuna Man Med Spine Nerves* 2008;3:19-28. [in Korean].
- [71] Kim JY, Kim SM, Kim TH, Park BY, Jun BC, Choi WS. A Case Report of Patient with Muscles Weakness Caused by Chronic Lumbar Disc Herniation. *J Korean Chuna Man Med Spine Nerves* 2010;5:159-168. [in Korean].
- [72] Kang JH, Jang SK, Yim YK, Lee H, Lee BR. The Clinical Study on 1 Case of HNP Patient with Sequela of Epidural Block. *J Korean Orient Med* 2004;25:213-219. [in Korean].
- [73] You KG, Park MJ, Jung IM, Yeom SR, Kwon YD. A Case Report of Oriental Medical Treatment for the Left Lower Limb Monoplegia after Herniated Intervertebral Disc Operation at L-spine. *J Orient Rehabil Med* 2011;21:227-239. [in Korean].
- [74] Kim SN, Lim JA, Lee SY, Yun JM, Choi SY, Kim HH et al. A Case of Neurogenic Bladder Patient with Lumbar Disc Herniation. *J Korean Acupunct Moxib Soc* 2005;22:155-163. [in Korean].
- [75] Hwang GT, Kim YI, Hong KE, Yim YK, Lee H. A Case of chronic sciatica patient with HIVD of L-Spine treated with Ohotics. *J Haehwa Med* 2005;14:95-100. [in Korean].
- [76] Health Insurance Review & Assessment Service [Internet]. Medical Statistics Index in 2017. Available from: <https://www.hira.or.kr/bbsDummy.do?pgmid=HIRAA020045010000&brdScnBltno=4&brdBltno=2296&pageIndex=1#none>.
- [77] Zhao ZQ. Neural mechanism underlying acupuncture analgesia. *Prog Neurobiol* 2008;85:355-375.
- [78] Wong Lit Wan D, Wang Y, Wang LP, Zheng Z, Liang FR. Local and distant acupuncture points stimulation for chronic musculoskeletal pain: A systematic review on the comparative effects. *Eur J Pain* 2015;19:1232-1247.
- [79] Carlsson C. Acupuncture mechanisms for clinically relevant long-term effects. *Acupunct Med* 2002;20:82-99.
- [80] Goldman N, Chen M, Fujita T, Xu Q, Peng W, Liu W, Jensen TK et al. Adenosine A1 receptors mediate local anti-nociceptive effects of acupuncture. *Nat Neurosci* 2010;13:883-888.
- [81] Cui JM, Ma SX, Wu SJ, Yang XX, Qi F. Effect of needling "Housanli" (ST 36) with different retaining-needle time on the pain threshold of mice using the hot water tail-flick test. *Zhongguo Zhen Jiu* 2009;29:653-654.
- [82] Burr R. Clinical guidelines for diagnosis and treatment of lumbar disc herniation with radiculopathy. *North American Spine Society*; 2012.

## Appendix 1.

Search strategy for each database.

### 1.1. MEDLINE - PubMed

#1 Intervertebral Disc Displacement [Mesh]  
 #2 Sciatica [Mesh]  
 #3 Polyradiculopathy [Mesh]  
 #4 (disc OR discs OR disk OR disks OR nucleus pulposus OR sacroilia\* OR Sacroiliac-joint)  
 #5 (displacement OR degeneration OR hernia\* OR protr\* OR perfora\* OR ruptur\* OR degenerat\* OR degradat\* OR displac\* OR prolaps\* OR avuls\* OR extru\*)  
 #6 #4 AND #5  
 #7 (nerve root OR nerve roots OR nerve)  
 #8 (compress\* OR entrap\* OR inflammat\* OR disorder\*)  
 #9 #7 AND #8  
 #10 (polyradiculopathy OR radiculopath\* OR radiculiti\* OR sciatic)  
 #11 {or #1, #2, #3, #6, #9, #10}  
 #12 (Acupuncture)  
 #13 #11 AND #12

### 1.2. CENTRAL - Cochrane

#1 Intervertebral disk displacement [ti, ab, kw]  
 #2 sciatica [ti, ab, kw]  
 #3 polyradiculopathy [ti, ab, kw]  
 #4 (disc OR discs OR disk OR disks OR nucleus pulposus OR sacroilia\* OR Sacroiliac-joint) [ti, ab, kw]  
 #5 (displacement OR degeneration OR hernia\* OR protr\* OR perfora\* OR ruptur\* OR degenerat\* OR degradat\* OR displac\* OR prolaps\* OR avuls\* OR extru\*) [ti, ab, kw]  
 #6 #4 AND #5  
 #7 (nerve root OR nerve roots OR nerve) [ti, ab, kw]  
 #8 (compress\* OR entrap\* OR inflammat\* OR disorder\*) [ti, ab, kw]  
 #9 #7 AND #8  
 #10 (polyradiculopathy OR radiculopath\* OR radiculiti\* OR sciatic) [ti, ab, kw]  
 #11 {or #1-#3, #6, #9, #10}  
 #12 (Acupuncture) [ti, ab, kw]  
 #13 #11 AND #12

### 1.3. EMBASE

#1 'Intervertebral disk displacement'/exp  
 #2 'sciatica'/exp  
 #3 'polyradiculopathy'/exp  
 #4 (disc OR discs OR disk OR disks OR nucleus pulposus OR sacroilia\* OR Sacroiliac-joint): ab,ti

#5 (displacement OR degeneration OR hernia\* OR protr\* OR perfora\* OR ruptur\* OR degenerat\* OR degradat\* OR displac\* OR prolaps\* OR avuls\* OR extru\*): ab, ti  
 #6 #4 AND #5  
 #7 (nerve root OR nerve roots OR nerve): ab, ti  
 #8 (compress\* OR entrap\* OR inflammat\* OR disorder\*): ab, ti  
 #9 #7 AND #8  
 #10 (polyradiculopathy OR radiculopath\* OR radiculiti\* OR sciatic): ab, ti  
 #11 {or #1-#3, #6, #9, #10}  
 #12 (Acupuncture): ab, ti  
 #13 #11 AND #12

### 1.4. CNKI

"HIVD" OR "Herniated Intervertebral disc" OR "HNP" OR "Herniated nucleus pulposus" OR "spinal disc herniation" OR "intervertebral disc herniation" OR "herniated disc" OR "Intervertebral disc displacement" AND "Acupuncture"

### 1.5. KoreaMed

((disc [ALL] OR nucleus pulposus [ALL]) AND (displacement [ALL] OR degeneration [ALL] OR hernia [ALL])) AND (Acupuncture [ALL])

### 1.6. KMBase

((([ALL=disc] OR [ALL=nucleus pulposus]) AND ([AHL=displacement] OR [ALL=degeneration] OR [ALL=hernia\*])) AND [ALL=Acupuncture])

### 1.7. KISS

((((disc OR nucleus pulposus) AND (displacement OR degeneration OR hernia\*))) AND Acupuncture)

### 1.8. NDSL

((((disc OR nucleus pulposus) AND (displacement OR degeneration OR hernia\*)) AND (Acupuncture))

### 1.9. KISTI

(BI: disc hernia\*) OR (BI: nucleus pulposus hernia\*) OR (BI: disc displacement) OR (BI: nucleus pulposus displacement) OR (BI: disc degeneration) OR (BI: nucleus pulposus degeneration) AND (BI: Acupuncture)

### 1.10. OASIS

((((disc OR nucleus pulposus) AND (displacement OR degeneration OR hernia\*)) AND (Acupuncture))