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CLINICAL CASE REPORT

Clinical Effect of Acupotomy Combined with Korean Medicine: A Case Series of a Herniated Intervertebral Disc

Hyun-ji Kim*, Ju-hyun Jeon, Young-il Kim

Department of Acupuncture and Moxibustion Medicine, College of Korean Medicine, Daejeon University, Daejeon, South Korea

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acupotomy;
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Abstract
The aim of this study is to evaluate the effect of acupotomy for treating patients with a herniated intervertebral disc (HIVD). This case series includes five HIVD patients who were treated at the Department of Acupuncture and Moxibustion, Daejeon University Dunsan Korean Hospital, Daejeon, Korea, from January 2015 to April 2015. Acupotomy was performed three times over a 2-week period, along with Korean medical treatment. The outcomes were evaluated by using a numeric rating scale (NRS), physical examination, the Oswestry Low Back Pain Disability Index (ODI), the Short-Form 36-Item Health Survey (SF-36), and the Surgical Safety Checklist. The NRS and physical examination results, as well as the ODI scores, were improved in all cases. No significant differences were noted on the SF-36. No patients had any adverse effects. This study, with its findings of encouraging responses in reducing low back pain and radiating pain and in recovering the kinetic state of soft tissue, supports the potential use of acupotomy for the treatment of patients suffering from HIVD.

* Corresponding author. Department of Acupuncture and Moxibustion, Dunsan Korean Hospital, 176-75, Daeduk-ro, Seo-gu, Daejeon, South Korea.
E-mail: omdkim01@dju.kr (H.J. Kim).

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1. Introduction

Acupotomy is a combined simple therapy of Korean Medicine and modern surgical principles that is used as the main tool for treating chronic soft tissue injury and bone hyperplasia with a bladed needle that has a thick flat-head and a cylindrical body [1—3]. The aim of acupotomy is to recover the kinetic state of soft tissue from peeling adhesion, remove attached tissues, and reduce pressure on the nerve [4]. Acupotomy has many benefits because it converts open surgery to closed surgery, thus reducing risk, time, and cost [2]. This method leaves only a small scar that will fade with time.

Though started in China, acupotomy has recently been investigated in Korea. In a review of trends for acupotomy, from January 1999 to May 2014, 28 acupotomy clinical research papers were reported in Korea while 11 papers were reported in China [5]. Many practitioners in Korea use acupotomy in their clinics and still more case reports are being presented [6]. Furthermore, Korean researchers have obtained a patent for an acupotomy needle [7].

Based on this information, a hypothesis can be put forth that acupotomy may be beneficial in regulating musculoskeletal disorders, especially those due to chronic accumulated injury [8] such as a herniated intervertebral disc (HIVD) of the lumbar spine [9]. Although HIVD is one of the most common spinal degenerative disorders, its surgical treatment has many limitations [10]. To date, few reports have addressed the therapeutic effect of acupotomy on patients with HIVD. This case series describes the results for five consecutive patients with HIVD who were treated with acupotomy.

2. Case Presentation

2.1. Characteristics of the participants in the study

Five consecutive patients who had been diagnosed with HIVD by using magnetic resonance imaging (MRI) or computed tomography (CT), and who were treated in our department from January 2015 to April 2015 were included in this case series. Ages ranged from 29 years to 58 years. All patients had received conservative treatments (exercise, acupuncture treatment, physical therapy, nerve block, and epidural neuroplasty) from other hospitals, and all prior attempts at management had failed. The duration of symptoms ranged from 10 months to 24 months (median, 14 months). Low back pain (LBP), radiating pain, gait disturbance, and sleep disorder due to pain were the chief complaints in all patients (Table 1). This case series was in compliance with the ethical standards of the Declaration of Helsinki. Patients who had coagulopathy, abnormal findings on their ECG or blood test, muscle atrophy, abnormal tendon reflexes, or medical conditions that could affect radicular pain were excluded.

2.2. Intervention

Before performing acupotomy, we explained the procedure and possible adverse effects. The patients provided written informed consent (Appendix 1).

Three treatment sessions were given over 2 weeks by a single practitioner. A doctor of Korean medicine with 22 years of clinical experience and 3 years of acupotomy experience, who was not involved in evaluating the effects of treatment, led all procedures. We followed the guidelines of Standards for Reporting Interventions in Controlled Trials of Acupuncture (STRICTA; Table 2) [11]. We used a flat-head-screw-driver-shaped stainless-steel disposable acupotomy needle (1.2-mm diameter and 75-mm long; Hansung Precision Manufacture, Seoul, South Korea).

After the MRI or CT findings had been evaluated, the participant's skin over the corresponding disc level was marked while the patient was in the prone position. The participant's lower back was sterilized and anesthetized with lidocaine in advance. The needles were inserted at three points; acupotomy target points were 20—30 mm apart on the spinous process at the level of the herniated disc, and on both sides of the surrounding inner core muscles where tenderness appeared. They were inserted to depths of 50—60 mm. The practitioner stimulated the soft tissue until the tenderness disappeared. During the treatment, the practitioner checked whether any patients experienced pain and numbness due to nerve damage (Fig. 1).

After acupotomy, we applied a disposable sterilized wet-cupping [12] and sterilized the acupotomy site (Fig. 2). Then, sterilized gauze was applied to the site. We warned the patients to beware of infection at the site. Every patient took admission treatment from 1 day to 1 week after the last acupotomy in order to control pain and prevent adverse effects.

Other acupuncture treatments were performed to support the effect of acupotomy twice a day by a single Korean doctor who had received postgraduate training in acupuncture and had $>$ 2 years of clinical experience. Stainless-steel disposable sterilized acupuncture needles

Table 1 Demographic information.

Patients	Age (y)	Duration (mo)	Stage
1	55	24	L5-S1, central to left paracentral, extruded disc
2	38	10	L3-4, central to left protruded disc
3	58	12	L3-4, left protruded disc
4	56	12	L2-3, 3-4, 4-5, 5-S1, degenerative diffuse bulging disc with annular tear, with mild thecal sac compression
5	29	12	L4-5, central protruded disc

Table 2 Therapy by the STRICTA recommendation.

Item	Details
Acupuncture rationale	(1A) Style of acupuncture: acupotomy procedure. (1B) Reasoning for treatment provided, based on historical context, literature sources, &/or consensus methods, with references where appropriate: we suggest acupotomy. as an efficient treatment for HIVD of lumbar spine.[9] (1C) Extent to which treatment was varied: each patient received individualized acupotomy treatments focused on symptoms & degenerated disc levels diagnosed by MRI or CT.
Details of needling	(2A) No. of needle insertions per patient per session (mean & range where relevant): 3 needle insertions per session. (2B) Names (or location if no standard name) of points used (uni/bilateral): the needles were inserted 20—30 mm apart on the spinous process of the herniated disc level. The target points were inner core muscles where tenderness appeared (both sides). (2C) Depth of insertion based on a specified unit of measurement or on a particular tissue level: the insertions were to depths of 50—60 mm. (2D) Response sought: pain & twinge (nerve stimulation). (2E) Needle stimulation: manual. (2F) Needle retention time: postprocedure removal. (2G) Needle type: a flat-head-screw-driver-shaped needle (1.2-mm diameter, 75-mm long; Hansung Precision Manufacture, Seoul, South Korea).
Treatment regimen	(3A) No. of treatment sessions: 3 times. (3B) Frequency & duration of treatment sessions: patients attended treatment sessions 3 times in 2 weeks for 5 minutes each session.
Other components of treatment	(4A) Details of other interventions administered to the acupuncture group (e.g., moxibustion, cupping, herbs, exercises, lifestyle advice): i. Acupuncture treatments were performed twice a day with stainless-steel disposable sterilized acupuncture needles (0.20-mm diameter & 30-mm long; Daehan Needle, SMC, Seoul, South Korea) The needles were inserted into local acupoints BL23, 24, & 25 & distant acupoints BL40, BL60, GB34, & K3 in each session on both sides of the body.[13] The needles were left in place for 20 min. They were inserted to a depth of 10—30 mm. ii. 120 mL of Bangpungtongseong-san was administered 3 times a day, 1 hour after meals. Bangpungtongseong-san (BPTS), made by Dunsan Korean Hospital, consists of 18 ingredients: namely, talcum 6.375 g, *Glycyrrhiza uralensis* 4.5 g, gypsum 2.625 g, *Scutellaria baicalensis* 2.625 g, *Platycodon grandiflorum* 2.625 g, *Ledebouriella seseloides* 1.6875 g, *Cnidium officinale* 1.6875 g, *Angelica gigas* 1.6875 g, *Paeonia lactiflora* 1.6875 g, *Rheum undulatum* 1.6875 g, *Ephedra sinica* 1.6875 g, *Mentha pulegium* 1.6875 g, *Forsythia koreana* 1.6875 g, *Erigeron canadensis* 1.6875 g, *Schizonepeta tenuifolia* 1.3125 g, *Atractylodes japonica* 1.31 g, *Gardenia jasminoides* 1.3 g, & *Zingiber officinale* 6.25 g. (4B) Setting & context of treatment, including instructions to practitioners, & information & explanations to patients: Collections of data before & after the treatment were carried out by the doctor of Korean medicine who made the diagnosis; the treatment was done by a different doctor of Korean medicine in a separate space on the basis of the patient's medical record & imaging diagnosis.
Practitioner background	(5) Description of participating acupuncturists (qualification or professional affiliation, years in acupuncture practice, other relevant experience): a doctor of Korean medicine with 22 y of clinical experience & 3 y of acupotomy experience led all procedures.
Control or comparator interventions	(6A) Rationale for the control or comparator in the context of the research question, with sources that justify this choice: no control group. (6B) Precise description of the control or comparator. If sham acupuncture or any other type of acupuncture-like control is used, provide details as for Items 1—3 above: no control group.

CT = computed tomography; HIVD = herniated intervertebral disc; MRI = magnetic resonance imaging; STRICTA = Standards for Reporting Interventions in Controlled Trials of Acupuncture.

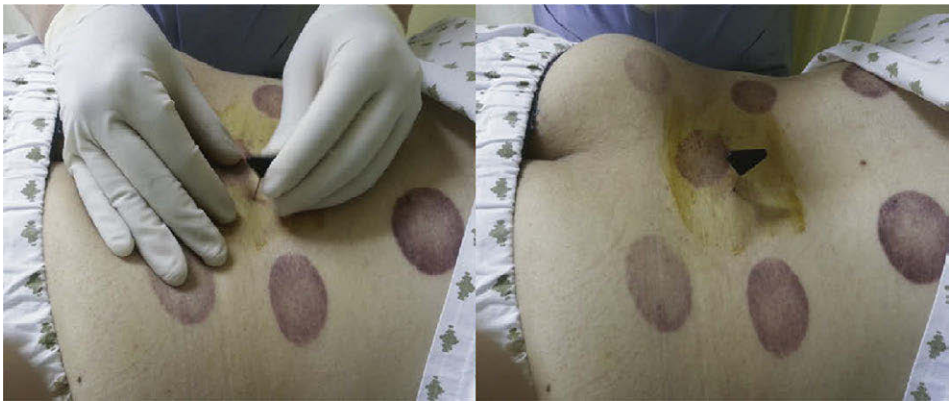

Figure 1 Application of acupotomy.

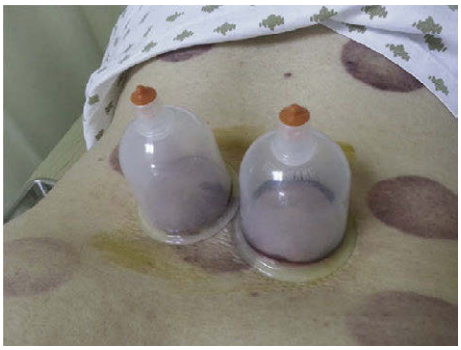

Figure 2 Application of wet cupping.

(0.20-mm diameter and 30-mm long; Daehan Needle, SMC, Seoul, South Korea) were inserted into local acupoints of BL23, BL24, and BL25 and distant acupoints BL40, BL60, GB34, and K3 in each session on both sides of the body [13]. The needles were left in place for 20 minutes. They were inserted to depths of 10—30 mm. To prevent secondary infection, patients also took 120 mL of Bangpungtongseongsan, three times a day, 1 hour after meals [14,15].

2.3. Assessment

The primary outcome measures were the numeric rating scale (NRS) and physical examination. These outcomes were used to evaluate the efficacy of the acupotomy treatment in decreasing LBP, radiating pain, and pain during activity. The outcomes were collected four times; 1 day before the initial acupotomy (baseline), at 1 day and 1 week after the last acupotomy, and at follow-up 4 weeks after the last acupotomy.

On the NRS, patients score their pain from 0 to 10, with higher scores indicating more problems [16]. Physical examination was evaluated by using active range of motion (ROM) of the lumbar spine, including flexion, extension, lateral bending, and rotation, and by using the straight leg raising test (SLRT). Physical examination was evaluated based on the visual angle, with a plus mark being given when a patient complained of pain during a specific movement. A single Korean medical doctor who was blinded to the assignment recorded outcome measures at 7:00 AM in the morning when patients were in a stable condition.

The secondary outcome measures were the Oswestry Low Back Pain Disability Index (ODI), the Short-Form 36-Item Health Survey (SF-36), and the Surgical Safety Checklist (SSC). The ODI data were collected three times: baseline, and 1 week and 4 weeks after the last acupotomy. This disease-specific questionnaire included 10 subscales evaluating disability in daily life. The ODI subscale scores ranged from 0 to 50, with higher scores indicating less severity [17]. We applied the Korean version of the index [18].

Participants were asked to complete the SF-36 at baseline and 4 weeks after the last acupotomy [19]. This questionnaire assesses eight health concepts, including limitations in physical activities, in social activities, and in usual role activities due to the physical health problems and emotional problems, bodily pain, general mental health, vitality (energy and fatigue), and general health perceptions. Total scores were considered for the evaluation of both the physical and the mental component summary [20,21]. The SF-36 was evaluated according to the scoring instructions of Ware et al [22], where 0 indicated absence of limitations and 100 indicated very severe limitations. The Korean version of the SF-36 was applied [23].

We applied a safety checklist designed by the World Health Organization (WHO) in the course of treatment [24] (Fig. 3). If adverse effects appeared, blood tests were performed (Table 3).

2.4. Treatment results

The results of all cases are arranged in Tables 4—8 and Figs. 4—6. In each table, we put a plus or a minus sign, depending on existing pain or limited range on the SLR and the ROM tests. If a moderate disorder existed, we put a plus and a minus sign together (Tables 4—8, Figs. 4—6).

Case 1 At baseline, the NRS was 7, and the SLR test was positive at 70° on the left leg. The patient could not perform the ROM test because of pain. The ODI score was 29, and the SF-36 score was 71.14. One day after the last acupotomy, the NRS was 4, and the SLR test was unchanged. The ROM test was negative. One week later, the NRS was 2, and the SLR test was positive at 80° on the left leg. The patient performed the ROM test without pain. The

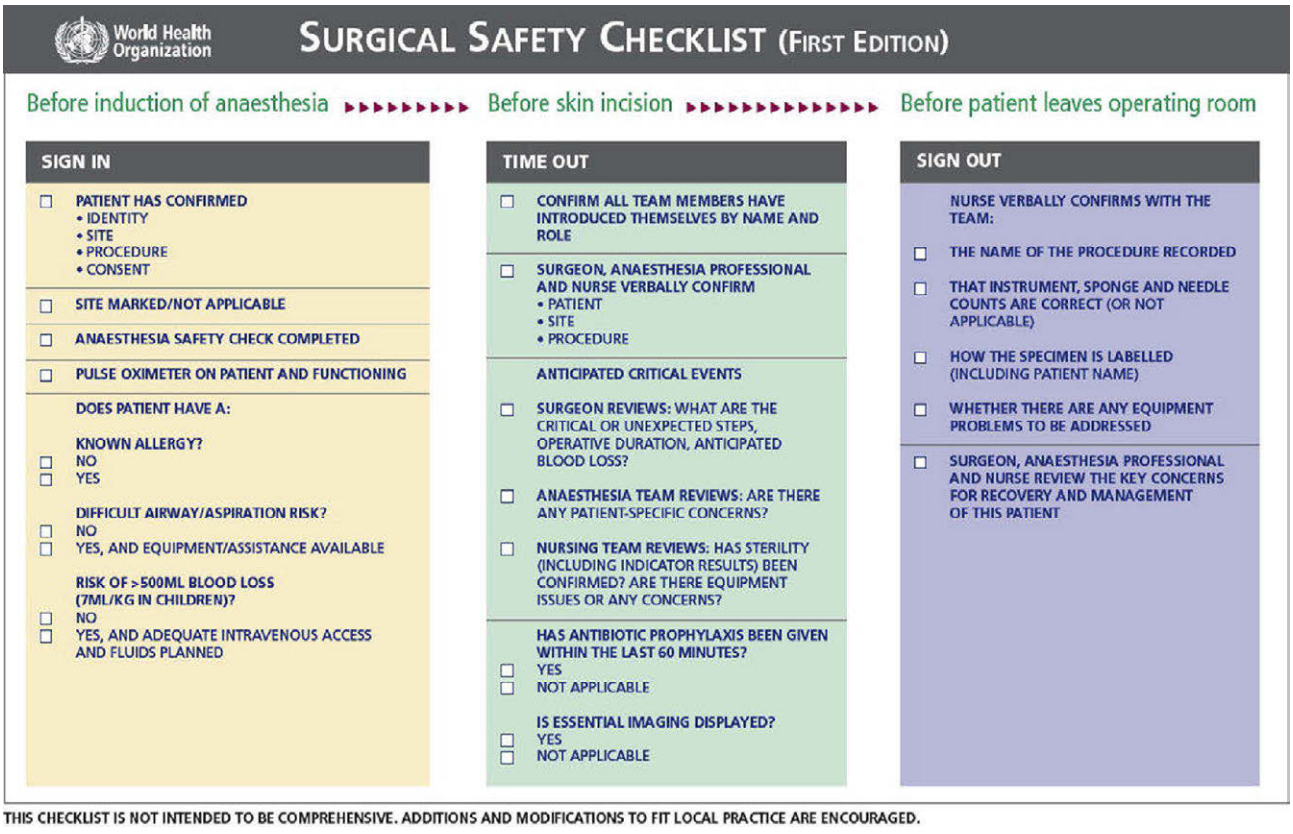

Figure 3 Surgical safety checklist created by the World Health Organization.

Table 3 Schedule for treatment and outcome measurement.

Period→	Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
Informed consent	√			
Demographic characteristics	√			
Medical history	√			
Clinical laboratory test	√			
NRS	√	√	√	√
Physical examination	√	√	√	√
ODI	√		√	√
SF-36	√			√
Safety assessment	√	√	√	√
Acuptomy treatment	√			

NRS = Numeric Rating Scale; ODI = Osweretry Low Back Pain Disability Index; SF-36 = Short-Form 36-Item Health Survey.

ODI score was 27. At follow-up 4 weeks after the last acupotomy, the NRS was 3, and the SLR and the ROM tests were negative. The ODI score was 15, and the SF-36 score was 68.46. No sign of any adverse effect appeared during the treatment sessions (Table 4).

Case 2 At baseline, the NRS was 5, and the SLR test was positive at 30° on both legs. The patient could perform the ROM test, but felt discomfort during every motion. The ODI score was 30, and the SF-36 score was 55.03. One day after the last acupotomy, the NRS was 5 and the SLR test was positive at 45° on both legs. The ROM test was unchanged. One week later, the NRS was 3, and the SLR test was positive at 55° and 45° on the right and the left legs, respectively. The patient felt less discomfort while performing the ROM test. The ODI score was 9. At follow-up 4 weeks after the last acupotomy, the NRS was 3—4, and the SLR test was positive at 80° and 45° on the right and left legs, respectively. The ROM test was unchanged. The ODI score was 3, and the SF-36 score was 87.92. No sign of any adverse effect appeared during the treatment sessions (Table 5).

Case 3 At baseline, the NRS was 10, and the SLR test was positive at 40° on the left leg. The lumbar extension was limited at 15°. Other motions were negative. The ODI score was 30, and the SF-36 score was 57.05. One day after the last acupotomy, the NRS was 8, and the SLR test was positive at 80° on the left leg. The ROM test was unchanged. One week after the last acupotomy, the NRS was 6, and the SLR test was negative. The lumbar extension was limited at

Table 4 Progress of Case 1.

		Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
NRS		7	4	2	3
SLRT		80/70+	80/70+	80/80+	—
ROM	Range	+	−	−	−
	Pain	+	−	−	−
ODI		29		27	15
SF-36		71.14			68.46

NRS = numeric rating scale; ODI = Oswerestry Low Back Pain Disability Index; ROM = range of motion; SF-36 = Short-Form 36-Item Health Survey; SLRT = Straight Leg Raising Test.

Table 5 Progress of Case 2.

		Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
NRS		5	5	3	3–4
SLRT		30+/30+	45+/45+	55+/45+	80+/45+
ROM	Range	−	−	−	−
	Pain	+	+	+/−	+/−
ODI		30		9	3
SF-36		55.03			87.92

NRS = numeric rating scale; ODI = Oswerestry Low Back Pain Disability Index; ROM = range of motion; SF-36 = Short-Form 36-Item Health Survey; SLRT = Straight Leg Raising Test.

20°, and the ODI score was 30. At follow-up 4 weeks after the last acupotomy, the NRS was 5, and the SLR test was negative. The patient could perform the ROM test without limitation, but pain remained. The ODI score was 27, and the SF-36 was 51.01. No sign of any adverse effect appeared during the treatment sessions (Table 6).

Case 4 At baseline, the NRS was 8, and the SLR test was positive at 60° on both legs. The patient could perform lumbar flexion to 30° and left lateral bending to 15°. The ODI score was 34, and the SF-36 score was 69.80. One day after the last acupotomy, the NRS was 1, the SLR test was positive at 80° on both legs, lumbar flexion had increased to 45°, and left lateral bending had increased to 35°. One week later, the NRS was 2, and the SLR test was positive at 80° and 60° on the right and the left legs, respectively. The patient could perform the ROM test with slight dull pain. The ODI score was 15. At follow-up 4 weeks after the last acupotomy, the NRS was 2, and the SLR test was positive at 80° on both legs. The ROM tests were similar. The ODI score was 13, and the SF-36 score was 64.43. No sign of any adverse effect appeared during the treatment sessions (Table 7).

Table 6 Progress of Case 3.

		Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
NRS		10	8	6	5
SLRT		80/40+	80/80+	80/80+	—
ROM	Range	+	+	+	−
	Pain	+	+	+	+
ODI		30		30	27
SF-36		57.05			51.01

NRS = numeric rating scale; ODI = Oswerestry Low Back Pain Disability Index; ROM = range of motion; SF-36 = Short-Form 36-Item Health Survey; SLRT = Straight Leg Raising Test.

Table 7 Progress of Case 4.

		Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
NRS		8	1	2	2
SLRT		60+/60+	80+/80+	80+/60+	80+/80+
ROM	Range	+	+	−	−
	Pain	+	+	+/−	+/−
ODI		34		15	13
SF-36		69.80			64.43

NRS = numeric rating scale; ODI = Oswerestry Low Back Pain Disability Index; ROM = range of motion; SF-36 = Short-Form 36-Item Health Survey; SLRT = Straight Leg Raising Test.

Table 8 Progress of Case 5.

		Baseline	1 d after acupotomy	1 wk after acupotomy	4 wk after acupotomy
NRS		7	3	1	1
SLRT		80(+)/80	80/80	80/80	80/80
ROM	Range	−	−	−	−
	Pain	+	+	+	−
ODI		14	—	13	12
SF-36		79.87	—	—	61.07

NRS = numeric rating scale; ODI = Oswerestry Low Back Pain Disability Index; ROM = range of motion; SF-36 = Short-Form 36-Item Health Survey; SLRT = Straight Leg Raising Test.

Case 5 At baseline, the NRS was 7, and the SLR test was positive at 80° on the right leg. Upon lumbar extension and left bending, pain appeared. The ODI score was 14, and the SF-36 score was 79.87. One day after the last acupotomy, the NRS was 3, and the SLR test was negative. The patient felt pain during lumbar extension. One week later, the NRS was 1, and the physical examination showed the same results as before. The ODI score was 13. At follow-up 4 weeks after the last acupotomy, the NRS was 1, and the SLR and the ROM tests were negative. The ODI score was 12 and the SF-36 score was 61.07. No sign of any adverse effect appeared during the treatment sessions (Table 8).

3. Discussion

Acupotomy was first introduced from China in 1976 [25]. Acupotomy is aggressive therapy that peels deep inside the lesions. By applying a knife-shaped needle tip to the attached tissue around the muscle and ligaments, acupotomy exfoliates adhesion [8]. As chronic adhesion is resolved and contractures are released, tissues are free to move during activity [7]. The area functions normally and the pain is resolved [26]. Thus, acupotomy clears blockages to restore dynamic balance [3]. Also, surrounding blood

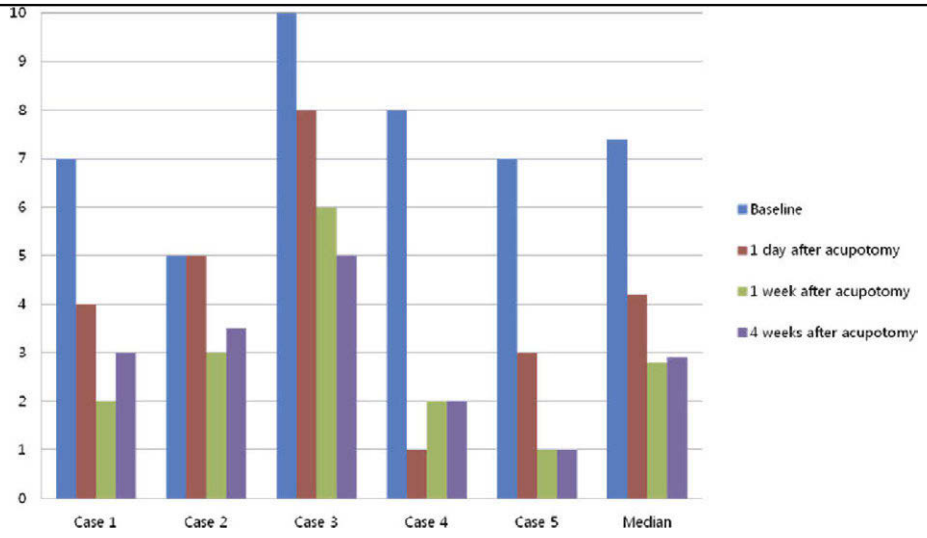

Figure 4 Change of the NRS in all cases. NRS = numeric rating scale.

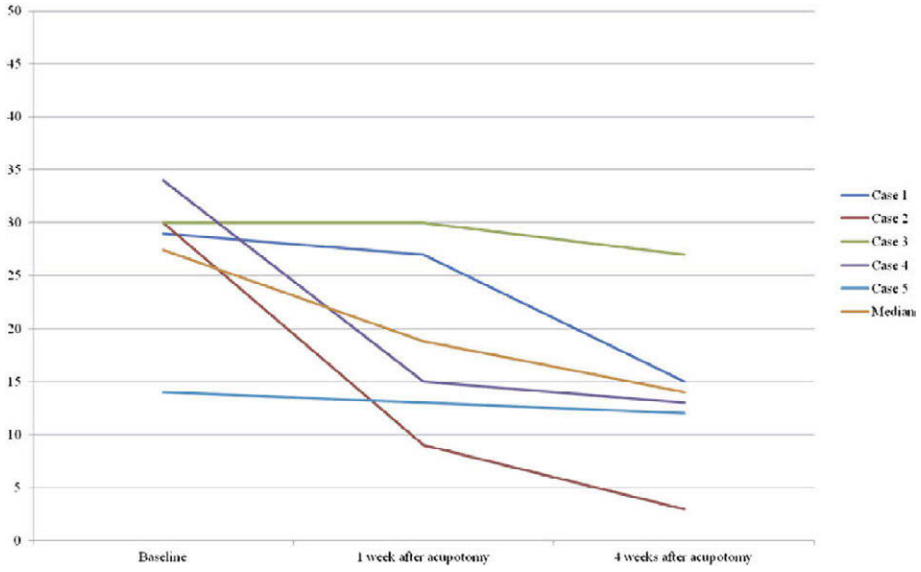

Figure 5 Change of the ODI scores in all cases. ODI = Oswestry Low Back Pain Disability Index.

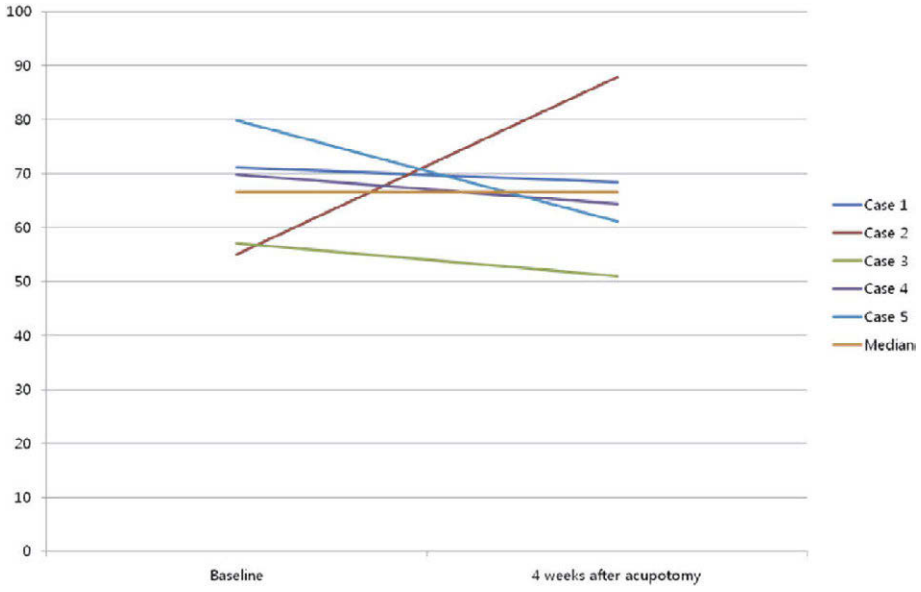

Figure 6 Change of the SF-36 scores in all cases. SF-36 = Short-Form 36-Item Health Survey.

circulation can be improved by securing the spinal canal space. Circulatory disturbances and further somatic pain and claudication caused by venous congestion can be reduced [27].

Acupotomy requires clear comprehension of anatomical structures and has a better therapeutic effect and maintenance than regular acupuncture, whose procedure is simple, but not influenced by condition [28]. Acupotomy has come to be widely used in the treatment of musculoskeletal diseases [7,29—31].

Previous studies have shown the efficacy of acupotomy for the treatment of patients with LBP and radiculopathy caused by HIVD. Recently, HIVD has been reported to have the highest incidence among public health problems, reaching almost 84% [32]. HIVD is caused by degenerative changes in intervertebral discs, showing tears of the annulus fibrosus surrounding the nucleus pulposus. It is one of the most common causes of LBP associated with radiculopathy [33—35]. Pain is known to occur because of a microhemocirculation disorder, edema, chemical stimulation, or an autoimmune response [36,37].

According to a systematic review of acupotomy [5], the number of clinical studies about HIVD treated with acupotomy from 1999 to 2014 was seven. Four studies reported decreased pain or ODI scores after acupotomy [4,6,38,39]. One clinical study evaluated the efficacy of acupotomy and spine decompression therapy for the treatment of patients with HIVD and reported superior outcomes when treatments were combined [28].

Due to the relatively low number of treated patients and the relatively uncontrolled, irregular conditions of clinical studies, more acupotomy clinical cases should be investigated to achieve an empirical protocol and to identify the beneficial effects of acupotomy for the treatment of patients with HIVD.

In this paper, we report the results of our empirical attempt to use acupotomy to treat HIVD in five participants who were being treated in our department from January 1, 2015 to April 31, 2015, for complaints of LBP and radiating pain. All participants had been diagnosed with HIVD by using MRI or CT.

We evaluated the efficacy of acupotomy by using the NRS, physical examination, the ODI, the SF-36, and the SSC. Five consecutive patients showed improved NRS results and improved results on physical examination. The average NRS score was reduced from 7.4 out of 10 at baseline to 4.2 after 1 day, 2.8 after 1 week, and 2.9 after 4 weeks. Acupotomy can be assumed to have resolved chronic adhesion, released contractures, and precipitated blood circulation, thus reducing the pain and recovering the dynamic state.

The average ODI score was reduced from 27.4 out of 50 to 18.8 after 1 week, and to 14 after 4 weeks. This may explain the improvements in the subjective signs of LBP in all cases. One study demonstrated decreased ODI scores in HIVD patients treated with a muscle energy technique and Korean traditional medicine therapy during a 3-week period [40]. In that study, the trend in the ODI scores was similar to that in our study (a decrease from 40.71 $\pm$ 6.05 to 25.14 $\pm$ 3.02). Another study demonstrated decreased ODI scores in patients treated with Carthami Flos pharmacopuncture and Korean traditional medicine therapy during a 10-day period [41]. The decline in the ODI scores in that study was smaller than the decline observed in our current study (a decrease from 38.80 $\pm$ 11.63 to 34.70 $\pm$ 11.70 after 5 days, and to 29.90 $\pm$ 10.60 after 10 days).

In our study, the SF-36 scores improved only in Case 2, while the scores of the other cases degenerated slightly. A previous study showed improved results on the short-form McGill pain questionnaire for patients treated with acupotomy [42]. However, another study showed that the use of the SF-36 was more appropriate for lumbar spine assessments [17]. Our procedure did not seem to produce long-term improvements on the SF-36. Further and longer clinical trials are needed to examine the hypothesis that acupotomy is a useful technique for treating patients with HIVD. No case showed any adverse effects during the treatment period.

After acupotomy, we applied disposable sterilized wet-cupping on the acupotomy site. The wet-cupping procedure generally consists of lacerating the skin, creating a vacuum on the skin and extracting a small amount of blood [43]. This method supports acupotomy by removing blood stasis and controlling the physiochemical balance of the treated site to improve blood circulation and recovery of the lesion [44,45]. It can also help reduce pain and compression [46,47].

This study has inherent limitations in that it is a case series which has no control treatment. These findings cannot be generalized to the broader community based on this study alone. This case series reports purely descriptive statistics; no statistical analyses that would determine whether the findings were statistically significant were done. Also, we cannot completely discount the possibility that an intervention other than acupotomy may have alleviated the symptoms related to HIVD. However, our results suggest that the use of an empirical protocol to treat patients with HIVD holds promise. As the current study was carried out under more controlled conditions, with equal times of acupotomy and regular follow-up, compared to previous clinical studies, its findings are encouraging [4,6,30].

In conclusion, despite further investigations being necessary, this case series supports the potential use of acupotomy for the treatment of LBP and radiating pain in patients with HIVD. In future studies, larger sample sizes and longer prospective randomized clinical trials are needed, and comparisons between acupotomy and other HIVD therapies must be implemented.

Disclosure statement

The authors declare that they have no conflicts of interest and no financial interests related to the material of this manuscript.

Acknowledgments

This study has received no financial support.

Appendix 1

Patient number:
Name:
Age:
Gender: M/F
Dep.:
Ward:
Date of Admission:

Patient Information and Consent Form

Doctor: **Signature:**

▪ **What is Acupotomy?**

Acupotomy is the Oriental therapy peeling deep inside the lesions, using a bladed needle which has a thick flat-head and cylindrical body. Its purpose is to resolve chronic soft tissue injury and adhesion, recovering kinetic state. It is an efficient therapy for chronic accumulated injury.

▪ **Procedure method**

We use a specialized acupotomy needle targeting to inner core muscles where tenderness appears. The needle depth is about 50–60mm. three needle points are selected in each session.

▪ **Alternative treatment**

We can substitute general acupuncture and pharmacopuncture treatment for acupotomy.

▪ **Expected results without acupotomy**

Recovery from disease could be delayed.

▪ **Possible side effects and precautions**

Though we sterilize a needle and acupotomy site directly, inflammation may possibly occur according to patient′s immunity. From anesthetic, side effects including shock, malignant hyperthermia, convulsion, vomiting, dizziness, or allergic response can appear.

On the day of the treatment, DO NOT STIMULATE the acupotomy sites by washing, taking a bath, or drinking. You are recommended to AVOID EXCESSIVE MOVEMENT for 3 days after treatment. You have to BE CAREFUL OF INFECTION on the acupotomy sites, where sterilized gauze will be applied. This treatment has more possibility of infection than general acupuncture, and side effects including palpitation, dizziness and hypotension may occur after treatment.

▪ **Please check if you are included**

☐ You have central nervous system diseases

☐ You have possibility of pregnancy

☐ You have severe hypertension

☐ You are taking antithrombotic drugs like Warfarin, Aspirin and else, OR you are suffering from hemostatic disorder.

☐ You have any surgery history or you are currently receiving treatment. (Name of Disease:)

I received sufficient explanation about the acupotomy treatment, and fully understand causable complications (inflammation, palpitation, dizziness, or hypotension) with acupotomy. I agree to this consent and entrust the treatment to medical attendant.

Dates: _____, _____ 2015

、 Patient: (signature:)

、 Substitute (Relation with patient:) : (signature:)

–> For ☐ The patient could not comprehend this form due to somatopsychic disorder.

☐ The patient is underage.

☐ It is obvious that this explanation could adversely affect the patient's condition.

☐ The patient personally delegates right to consent to specific person.

☐ Others ( )

Daejeon University, Dunsan Korean Hospital

References

[1] Zhu HZ. *Acupotomy*. Beijing: Chinese Medicine Publishing Company; 1992 [in Chinese].

[2] The Institute of Korean Acupotomy Medicine. *Acupotomy*. Seoul: Jeongdam. 2003, 81–2,87,113,127 [in Korean].

[3] Guo C, Liu N, Li X, Sun H, Hu B, Lu J, et al. Effect of acupotomy on nitric oxide synthase and beta-endorphin in third lumbar vertebrae transverse process syndrome model rats. *J Tradit Chin Med*. 2014;34:194–198.

[4] Lee GM, Kim DH, Kim HW, Yeom SC, Kim HS, Kim DE, et al. The study on the effect of acupotomy in lumbar HIVD. *J Korean Acupunct Moxibust Soc*. 2008;25:183–190 [in Korean].

[5] Yuk DI, Kim KM, Jeon JH, Kim YI, Kim JH. A review of trends for acupotomy. *J Korean Acupunct Moxibust Soc*. 2014;31:35–43.

[6] Kim SY, Kim HJ, Ji YS, Lee SM, Kim YI. The effect of acupotomy on lumbar and cervical spine combined with Korean medical treatment: report of five cases. *J Korean Acupunct Moxibust Soc*. 2014;31:183–193.

[7] Lee GM, Lee EY, Han JH, Cho KH, Kang SR, Yoon SH. Effects of Wonli acupuncture procedure in patients with LSS: a clinical, retrospective study. *Evid Based Complement Alternat Med*. 2014;2014:212098.

[8] Lim NR, Kim SC, Jang EH, Na WM, Lim SI, Shin JB, et al. Case study of Oriental medicine treatment with acupotomy therapy of the carpal tunnel syndrome. *J Korean Acupunct Moxibust Soc*. 2008;25:163–170.

[9] Yun JW, Kim DH, Kim HW, Kim SS, Park SW, Kim EK, et al. The clinical effects of acupuncture and acupotomy therapy for HIVD. *J Korean Acupunct Moxibust Soc*. 2010;27:85–97 [in Korean].

[10] Kim CH, Chung CK, Park CS, Choi B, Kim MJ, Park BJ. Reoperation rate after surgery for lumbar herniated intervertebral disc disease: nationwide cohort study. *Spine*. 2013;38:581–590.

[11] MacPherson H, Altman DG, Hammerschlag R, Youping L, Taixiang W, White A, et al. Revised standards for reporting interventions in clinical trials of acupuncture (STRICTA): extending the CONSORT statement. *J Evid Based Med*. 2010;3:140–155.

[12] Tagil SM, Celik HT, Ciftci S, Kazanci FH, Arslan M, Erdamar N, et al. Wet-cupping removes oxidants and decreases oxidative stress. *Complement Ther Med*. 2014;22:1032–1036.

[13] Pach D, Yang-Strobel X, Lüdtke R, Roll S, Icke K, Brinkhaus B, et al. Standardized versus individualized acupuncture for

chronic low back pain: a randomized controlled trial. *Evid Based Complement Alternat Med*. 2013;2013:125937.
[14] Baek YJ. *Research on the clinical application of Bangpungtongseongsan in Dongeuibogam [master's thesis]*. [Wonju]: Graduate School of Sangji University; 2012:1—46 [in Korean].
[15] Kim JH, Lee JK, Shin HK. Analysis of studies on Bangpungtongseong-san (Fangfengtongsheng-san) to establish the fundament for evidence based medicine (EBM). *J Korean Oriental Med Ophtha Otolaryng Dermatol*. 2011;24:1—15 [in Korean].
[16] Wall P, Melzack R. *Textbook of pain. Pain Compilation Committee, translator*. Seoul: Jungdam Publishing Company; 2002:483—484 [in Korean].
[17] Fairbank JC, Couper J, Davies JB, O'Brien JP. The Oswestry low back pain disability questionnaire. *Physiotherapy*. 1980; 66:271—273.
[18] Kim DY, Lee SH, Lee HY, Lee HJ, Chang SB, Chung SK, et al. Validation of the Korean version of the oswestry disability index. *Spine*. 2005;30:123—127.
[19] Ghoname EA, Craig WF, White PF, Ahmed HE, Hamza MA, Henderson BN, et al. Percutaneous electrical nerve stimulation for low back pain: a randomized crossover study. *JAMA*. 1999;281:818—823.
[20] Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36), I: conceptual framework and item selection. *Med Care*. 1992;30:473—483.
[21] Ware JE, Kosinski M, Bayliss MS, McHorney CA, Rogers WH, Raczek A. Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from the medical outcomes study. *Med Care*. 1995;33:264—279.
[22] Ware JE. *SF-36 Physical and Mental Health Summary Scales: A Manual for Users of Version 1*. 2nd ed. Watertown: Quality Metric Inc.; 2001.
[23] Han CW, Lee EJ, Iwava T, Kataoka H, Kohzuki M. Development of the Korean version of short-form 36-item health survey: health related QOL of healthy elderly people and elderly patients in Korea. *Tohoku J Exp Med*. 2004;203:189—194.
[24] World Health Organization (WHO). *WHO Guidelines for Safe Surgery 2009: Safe Surgery Saves Lives*. 1st ed. Geneva: WHO; 2009.
[25] Huang LX. *Acupuncture Treatment Categorized Collection of Literatures on Chinese Acupuncture and Moxibution Technique*. 1st ed. Qingdao: Qingdao Publishing Company; 1996: 281—291 [in Chinese].
[26] Korea Small Acupotomy Association. *Small Acupotomy Therapy*. 1st ed. Seoul: Jungdam Publishing Company; 2003 [in Korean].
[27] Kobayashi S, Takeno K, Miyazaki T, Kubota M, Shimada S, Yayama T, et al. Effects of arterial ischemia and venous congestion on the lumbar nerve root in dogs. *J Orthop Res*. 2008;26:1533—1540.
[28] Park SW, Kim SS, Kim JY, Kim SH, Lee GM. The comparative study of effects between acupotomy and its cotreatment with spine decompression therapy on HIVD patients. *J Korean Acupunct Moxibust Soc*. 2012;29:29—39 [in Korean].
[29] Pang JG. *Basic and Clinical Theory of Acupotomy*. 1st ed. Shenzhen: Haitian Publishing House; 2006 [in Chinese].
[30] Yuk DI, Sung IS, Song DH, Kim MJ, Hong KE. Clinical study of lumbar spine stenosis treated by using acupotomy combined with Oriental medical treatments. *J Pharmacopuncture*. 2013; 16:46—51.
[31] Liu MR, Li L, He ZW. Efficacy observation on osteoarthritis of the knee treated with the ultrastructural acupotomy therapy at the counter-Ashi points. *Zhongguo Zehn Jiu*. 2012;32:621—624 [in Chinese].
[32] Balagué F, Mannion AF, Pellisé F, Cedraschi C. Nonspecific low back pain. *Lancet*. 2012;379:482—491.
[33] Korean Orthopedic Association. *Orthopedics*. 6th ed. Seoul: Choi-Shin Publishing Company; 2006:621—630 [in Korean].
[34] Chou R, Qaseem A, Snow V, Casey D, Cross Jr JT, Shekelle P, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med*. 2007; 147:478—491 [in Chinese].
[35] Goupille P, Jayson MI, Valat JP, Freemont AJ. The role of inflammation in disk herniation-associated radiculopathy. *Semin Arthritis Rheum*. 1998;28:60—71.
[36] Song BK. Study on the conservative treatment of herniated lumbar intervertebral disc. *J Korean Oriental Med*. 1995;16:62—78.
[37] Yang H, Liu H, Li Z, Zhang K, Wang J, Wang H, et al. Low back pain associated with lumbar disc herniation: role of moderately degenerative disc and annulus fibrous tears. *Int J Clin Exp Med*. 2015;8:1634—1644.
[38] Kwak BM, Hong KE. Four cases of HIVD-lumbar spine patients treated with acupotomy. *J Korean Acupunct Moxibust Soc*. 2008;25:149—156 [in Korean].
[39] Zhang YC, Xu YY, Yang SE, Bao SQ, Zhang L. Lumbar disc herniation treated with Shu-needle therapy and ozone injection of low concentration. *Zhongguo Zhen Jiu*. 2012;32:829—832.
[40] Chung JH, Yun YU, Cheong SH, Kim TH, Choi YJ, Kim SW, et al. Seven cases report on the foot drop patients with herniated intervertebral lumbar disc by muscle energy technique and Korean traditional medicine therapy. *J Korea Chuna Manual Med Spine Nerves*. 2014;9:27—37.
[41] Cho TS, Seo JC, Son IS, Kwon HY, Youn HM, Jang KJ, et al. The effect of CF herbal acupuncture by Oswestry Disability Index. *J Pharmacopuncture*. 2001;4:15—20 [in Korean].
[42] Zhi LX, Feng CW, Tu CY. Controlled randomized trial on therapeutic effects of acupotomy-injection combined with Feng's spinal manipulation (FSM) for cervical spondylotic radiculopathy. *Zhongguo Gu Shang*. 2008;21:421—424 [in Chinese].
[43] Kim JI, Lee MS, Lee DH, Boddy K, Ernst E. Cupping for treating pain: a systematic review. *Evid Based Complement Alternat Med*. 2011;2011:467014.
[44] Kim SC. Clinical characteristics of poor responders to acupotomy and safety pretreatment management. *J Korean Acupunct Moxibust Soc*. 2008;25:117—125.
[45] Jang EH, Kim SC, Lim NR, Na WM, Lim SI, Shin JB, et al. Case study of Oriental medicine treatment with acupotomy therapy of the herniated lumbar intervertebral disc patient. *J Korean Acupunct Moxibust Soc*. 2008;25:171—181 [in Korean].
[46] Kim JI, Kim TH, Lee MS, Kang JW, Kim KH, Choi JY, et al. Evaluation of wet-cupping therapy for persistent nonspecific low back pain: a randomised, waiting-list controlled, open-label, parallel-group pilot trial. *Trials*. 2011;12:146.
[47] Kim YJ, Kim DH, Yeom SC, Lim BC, Choi YS, Lee GH, et al. Experimental study on the pressure characteristics in the cupping therapy. *J Korean Acupunct Moxibust Soc*. 2008;25: 121—130 [in Korean].