

## Acupuncture for Treatment of Chronic Low-Back Pain Caused by Lumbar Spinal Stenosis: A Case Series

Allyson Augusta Shrikhande, MD,<sup>1</sup> Robert A. Schulman, MD,<sup>2</sup> Brian S. Lerner,<sup>3</sup>  
and Alex Moroz, MD,<sup>1</sup>

### ABSTRACT

**Background:** Chronic pain caused by lumbar stenosis remains a challenging clinical issue. There is a lack of consensus about the use of acupuncture as a potential treatment for lumbar stenosis.

**Objective:** The aim of this study was to review experience with using acupuncture treatment for decreasing pain symptoms and improving functional mobility and activities of daily living (ADL) in patients with lumbar stenosis.

**Design, Setting, and Patients:** Retrospective telephone interviews were completed with 7 adult patients with lumbar stenosis who received acupuncture treatment.

**Intervention:** Patients received various amounts of acupuncture treatments, and some patients underwent adjunctive physical therapy. The subjects were presented with a scale of 0–5 to assess improvement. Five indicated an improvement (pain symptoms eliminated, functional mobility returned to baseline) and zero indicated no improvement.

**Main Outcome Measures:** The main outcomes sought were reduction of pain and improvements in functional mobility and ADLs.

**Results:** Of the 7 subjects, 2 showed reduction of pain and improvement of function. The remaining 5 patients had no improvement. In the patients with symptom improvement, there was a lack of radicular pain prior to acupuncture treatment, an increase in the number of acupuncture sessions, and adjunctive physical therapy.

**Conclusions:** Acupuncture may be a useful adjunctive therapy in patients with lumbar spinal stenosis without radicular pain. More treatment sessions and concomitant physical therapy may improve results with acupuncture in this setting.

**Key Words:** Acupuncture, Lumbar Stenosis, Physical Therapy, Sciatic Pain

### INTRODUCTION

ACUPUNCTURE, AS NEEDLING THERAPY, is a kind of specialized sensory stimulation that is analyzed through sensory neural pathways.<sup>1</sup> Applying acupuncture shows reactions at local, regional, central nervous system (CNS), and general levels. In the local reaction, insertion of

an acupuncture needle begins the process of “neurogenic inflammation” in which the release of endogenous substances leads to increased sensitivity of nociceptors, activation of an anti-inflammatory cascade, and release of endogenous opioids. In the regional reaction, acupuncture effects stimulate the viscera-cutaneous, cutaneo-visceral, and cutaneo-muscular reflexes.<sup>1</sup>

<sup>1</sup>Rusk Institute of Rehabilitation, New York University Langone Medical Center, New York, NY.

<sup>2</sup>Private Practice, New York, NY.

<sup>3</sup>Medical Student, State University of New York (SUNY) Downstate Medical Center, Brooklyn, NY.

The CNS reaction involves a stimulus created by insertion of a needle to an acupuncture point. This stimulus is first transmitted to the spinal cord; then to the brainstem, thalamus, and sensory cortex; and then activates the pain-control system by stimulating neurons in the periaqueductal grey matter and in the periventricular region. Activating the pain-control system increases the concentration of  $\beta$ -endorphin, enkaphalin, serotonin, and norepinephrine levels in brain tissue and plasma, thus creating analgesic effects and positive effects on mood, energy levels, pleasure reception, and regulation of the immune system.<sup>2-4</sup> Han describes possible mechanisms for the analgesic effects of acupuncture through frequency-dependent electroacupuncture stimulation activation of various brain structures and/or the spinal cord via specific neural pathways through opioid peptides (dynorphin,  $\beta$ -endorphin, endomorphin, enkephalin) with their corresponding opioid receptors.<sup>5</sup>

Ongoing debate in the medical community is concerned with the role of the placebo effect in acupuncture. Langevin et al. have noted paradoxes in acupuncture research including the fact that true acupuncture has been shown to be superior to usual care, but does not outperform sham acupuncture significantly.<sup>6</sup> Although active and sham treatments have equivalent analgesic effects, acupuncture needle stimulation has shown analgesic effects in animal studies, and a number of imaging studies in humans have shown changes in limbic structures after traditional acupuncture that are distinct from changes after sham acupuncture.<sup>7,8</sup> Zyloney et al. found that continuous genuine electrical acupuncture stimulation can modify the coupling of spontaneous activity in brain regions that play a role in modulating pain perception.<sup>9</sup>

Lumbar spinal stenosis is defined as narrowing of the intraspinal (central) canal, lateral recess, or neural foramen. Lateral recess and neural foraminal stenosis can cause nerve-root compression and a patient can present with radicular pain, weakness, or loss of sensation in the distribution of the affected spinal nerve. Central canal stenosis can present with radicular symptoms or with neurogenic claudication. Low-back pain can be a presenting symptom of central or lateral lumbar spinal stenosis. How does acupuncture fare in treatment of low-back pain, particularly lumbar spinal stenosis? Motohiro et al. reported on the clinical efficacy of acupuncture treatment for lumbar spinal canal stenosis and herniated discs. These researchers examined the effects of acupuncture stimulation at Ex-B2 (paravertebral point), at the lumbar level where the disorder was present, electroacupuncture stimulation of the pudendal nerve, and electroacupuncture stimulation of the nerve root.<sup>10</sup> The results of this trial indicated that acupuncture stimulation at the disorder level Ex-B2 provides relief to a certain extent (reduction in low-back pain and in lower-limb pain from spinal canal stenosis in 50%–60% of cases, reduction in low-back pain and in lower-limb pain from herniated discs in 50% and 42% of cases, respectively), but in many cases this treatment had no effect. A favorable effect

in limb dysesthesia was observed in only 30% of spinal stenosis cases and in 33% of herniated disc cases. Electroacupuncture stimulation of the pudendal nerve was effective even for cases that had gotten no effect from stimulation at disorder level Ex-B2. With electroacupuncture stimulation of the nerve root, the effect was strongest and provided a long-term effect.<sup>6</sup>

This case series describes the effect of acupuncture on patients with lumbar stenosis. The benefits and shortcomings of acupuncture techniques for use in treating back pain associated with lumbar stenosis are discussed.

## PATIENTS AND METHODS

### Patients

Seven patients with chronic low-back pain were recruited to participate in the study. Patients included were those reporting both functional limitations and back pain secondary to lumbar spinal stenosis for at least 3 months with or without radiation of pain down to a lower extremity. There were 4 males and 3 females, ranging from ages 56 to 84 (average age, 73). All of these patients had lumbar spinal stenosis confirmed by magnetic resonance imaging (MRI); 7 patients had lateral foraminal stenosis and 6 patients had central canal stenosis. See Table 1 for more detail. Exclusion criteria were patients with previous spinal surgery, systemic arthritis, metastatic spinal disease, or acute fracture of the spine. In all of these patients, oral medications including, nonsteroidal anti-inflammatory drugs, acetaminophen, tricyclic antidepressants, antiseizure medications, and opiates failed to relieve their pain. Four of the 7 patients had received epidurals or nerve blocks prior to acupuncture therapy.

### Methods

This was a retrospective case series of 7 patients who presented to the New York University Rusk Medical Center, New York, NY, outpatient physical medicine and rehabilitation clinic from 2005 to 2009. A follow-up phone call was made to each patient regarding the study at an average

TABLE 1. RESULTS OF ACUPUNCTURE ON LUMBAR STENOSIS

Patient	Claudication	Foraminal stenosis	Central stenosis	Improvement
Patient A	+	+	–	No
Patient B	+	+	+	No
Patient C	+	+	+	No
Patient D*	+	+	+	No
Patient E*	+	+	+	No
Patient F	+	+	+	Yes
Patient G	–	+	+	Yes

\*Patient reported stenosis.

follow-up time of 13 months. All patients gave informed consent verbally and the study objectives were then explained. Patients were then asked a series of questions about their functional abilities and pain relief with acupuncture treatment. The patients were presented with a scale from 0–5 to determine how much acupuncture helped with activities of daily living (ADLs; dressing, showering, cooking, cleaning, and shopping) and pain. The scale was designed specifically for this study. It was used to assess and compare pain and function. Zero signified that acupuncture did not provide pain relief or improve functional abilities. A score of 5 meant the acupuncture treatment led to full restoration of functional ability and/or complete relief of back pain. Functional abilities and pain relief were assessed in both the short-term (<6 months after completion of acupuncture treatment series) and the long-term (at the time of the follow-up phone call at an average of 13 months after completion of acupuncture treatment series). Patients were also asked what adjunctive therapies they were participating in while they were receiving acupuncture treatment. Finally, patients were asked to recall “what happened” after acupuncture therapy in both the short- and long-term.

In this case series, acupuncture was performed by the principal investigator, a physician acupuncturist who completed the University of California–Los Angeles/Helms Medical Institute course, “Medical Acupuncture for Physicians.” Various therapeutic inputs were determined according to the treatment strategy described below:

1. Kidney-Bladder distinct meridian Couplet-diverge from their principal meridians in the popliteal fossa and proceed to their primary and coupled organs
2. Super Ming Men (GV 4, BL 23 b/l, BL 24 b/l, BL 52 b/l)
3. Lumbosacral percutaneous electrical nerve stimulation (PENS).

Each treatment session lasted 40 minutes and patients were seen an average of every 7–18 days. Stainless steel Seirin L type Number 5 needles (0.25 × 30 mm) were used. The needles were inserted to the depth of ¼ of an inch. No manipulation was performed after insertion. Low frequency electrical stimulation (2–4 Hz) was performed to enhance the acupuncture effects. Points needled included (bilateral) BL 40, KI 10, BL 10, BL 23, BL 52, BL 24, BL 26, and GV 4. After needle insertion using a guide tube, BL 40, KI 10, and BL 10 were connected in a “daisy chain” fashion (positive–negative–positive–negative, etc.) and stimulated at 4 Hz using an ITO IC-1107+ stimulator. BL 23, BL 52, BL 24, BL 26, and GV 4 were stimulated using pure moxa rolls for 2–3 minutes.

## RESULTS

Scores of  $\geq 4$  points on the scale after acupuncture treatment were considered to be an indication of reduced

back pain and improved function. Of the 7 subjects, 2 showed an improvement in back pain, with ratings of 4 and 5. The same 2 patients also showed an improvement in their ADLs, with ratings of 4.5 and 5. The improvements in these 2 patients both short- and long-term, with the same scores for both time periods. The patients with improvement did not receive any invasive therapeutic techniques (epidurals, nerve blocks, surgery) before or after acupuncture. The remaining 5 patients demonstrated no reduction of low-back pain nor any improvement in their ability to perform ADLs, with ratings of 0 for both short- and long-term time periods. Four of these 5 patients went on to have epidurals, nerve blocks, or spinal surgery after the acupuncture treatment; these conventional treatments produced some reductions of pain and improvement in function. The last patient in the nonimprovement group was referred for cognitive-behavioral therapy and reported slow improvement with this method. All 5 patients in the nonimprovement group had neurogenic claudication prior to receiving acupuncture treatment. Four of the 5 patients in the nonimprovement group had radicular symptoms. None of the patients in the improvement group had radicular symptoms. One of the 2 patients (50%) in the improvement group had symptoms of claudication prior to receiving acupuncture treatment. The improvement group had received an average of 10.5 acupuncture sessions, whereas the nonimprovement group received an average of 2 acupuncture sessions. The 2 patients with improvement received concomitant physical therapy, which included generalized conditioning and an aerobic exercise program. Only 1 of the 5 patients in the nonimprovement group received physical therapy. The discrepancies in number of acupuncture treatment sessions and physical therapy participation occurred because of patient noncompliance with recommended protocol for numerous reasons including personal and financial. All patients were advised to have at least 5–10 acupuncture sessions and concomitant physical therapy. The MRI findings did not differ significantly between the improvement and nonimprovement groups. Table 2 presents a summary comparison of the improvement and nonimprovement groups.

## DISCUSSION

The present study indicates that acupuncture may be a useful therapy in patients with lumbar stenosis with low-back pain and claudication without radicular symptoms. More treatments sessions and concomitant physical therapy may also improve results with acupuncture for this condition.

Both patients in the improvement group had lateral foraminal stenosis (noted on their MRI reports) but did not have associated radicular symptoms. It is unclear why the patients with radicular symptoms prior to acupuncture therapy did not respond to the acupuncture treatment. Additional acupuncture treatments may have aided the

TABLE 2. COMPARISON OF IMPROVEMENT VERSUS NONIMPROVEMENT GROUPS\* IN STUDY POPULATION (N=7)

Group	Improvement	Nonimprovement
Number of patients	2	5
MRI findings of stenosis	Mild to severe	Mild to severe
Average number of acupuncture sessions	10.5	2
Concomitant physical therapy	All	1 of 5
Invasive therapeutic techniques	None	4 of 5
Radicular symptoms	None	4 of 5
Neurogenic claudication	None	2 of 5

\*Inclusion in the improvement group was defined as a  $\geq 4$  out of 5 in the short- and/or long-term follow-up regarding change in pain and/or function. MRI, magnetic resonance imaging.

response for these patients. Lumbar stenosis of the lateral recess or neural foramen is associated with radicular symptoms when there is nerve-root compression. Stenosis associated with nerve-root compression may be more difficult to treat. Further studies are required to assess what subset of patients with lumbar stenosis respond to acupuncture treatment and the mechanism of action behind it. Additional acupuncture treatment methods—such as deep needling of the psoas from the posterior approach, needling of the interspinous ligaments (to stimulate the medial branch of the posterior primary ramus),<sup>11</sup> needling of the huatuojiaji points (to stimulate the sinu-vertebral nerves), and BL 23 taken deeply past the transverse process of the fourth vertebra to stimulate the sympathetic ganglion<sup>11</sup>—may be necessary to provide efficacious treatment for this typically recalcitrant pain syndrome.

Patients who underwent concomitant physical therapy and or an exercise program had better outcomes with acupuncture and pain relief than those who had no physical therapy. This coincides with the current literature on the treatment of low-back pain. However, there is a lack of research studies in the literature on the outcomes of physical therapy on pain and function specifically for lumbar stenosis. Tomkins et al. demonstrated improved flexibility, strength, lumbar stabilization, and joint mobilization are key components in decreasing back pain with lumbar stenosis.<sup>12</sup> The theory behind physical therapy and a graded-exercise program decreasing pain and increasing function is multifactorial including the effects on the hypothalamic-pituitary axis and mechanical effects.<sup>13</sup> Exercise and physical therapy have been shown to stimulate the release of  $\beta$ -endorphin ( $\beta$ E), a 31-amino-acid peptide that can be released into the circulation from the pituitary gland or can project into areas of the brain through nerve fibers.<sup>14</sup> This peptide is an important pain reliever. Bender et al. demonstrated that various stressors and certain modalities of physiotherapy including massage, heat, and transcutaneous electrical nerve

stimulation are potent inducers of the release of endogenous  $\beta$ E to the bloodstream.<sup>13</sup> Most forms of exercise also increase blood  $\beta$ E level, especially when exercise intensity involves reaching the anaerobic threshold and is associated with the elevation of serum lactate level. This is best achieved with incremental graded and short-term anaerobic exercise.<sup>14</sup>

A significant limitation to this case series is the small sample number. Larger prospective studies are anticipated for greater elucidation of the issues raised. In addition, each of the patients had a different number of acupuncture treatment sessions. This makes it difficult to compare and contrast treatment results. The discrepancy in the number of treatments may have existed for several reasons including cost, time, and like or dislike of the needles or the doctor. Data on these factors were not collected, and, therefore, it is not possible to report the reasons for the discrepancy. It is possible that patients were discouraged when they did not experience immediate or long-lasting relief of their symptoms immediately following the first few treatments. A full MEDLINE® search was conducted to investigate the current literature on when patients should begin to have pain relief from acupuncture? The literature search was conducted to see if the literature describes an immediate or gradual experience of pain relief. Little research has been done to answer this question. The more the medical field learns about this, the better practitioners can communicate with their patients about what they should expect.

Finally, it is difficult to assess what helped the 2 patients improve. It may have been the acupuncture treatment sessions, physical therapy, or a pharmacological modality. Future studies will can use control groups in an advantageous way to compare the efficacy of the aforementioned treatment options for lumbar stenosis.

## CONCLUSIONS

Acupuncture may have beneficial effects, including pain relief and functional improvement, in a specific subset of patients with lumbar stenosis. In the case series presented above, there was a lack of radicular pain prior to acupuncture treatment in patients with symptom reduction. As understanding of the physiologic basis of acupuncture continues to grow, there is the potential for indentifying, with greater facility, those patients who might benefit from acupuncture therapy. Patients undergoing acupuncture treatment should be encouraged to have concomitant physical therapy and or a graded exercise program.

## DISCLOSURE STATEMENT

No competing financial interests exist for any of the authors.

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Address correspondence to:  
 Allyson Augusta Shrikhande, MD  
 Rusk Institute of Rehabilitation  
 New York University Langone Medical Center  
 300 East 34th Street, Suite 600  
 New York, NY 10016

E-mail: Allyson.Augusta@nyumc.org

