

## RESEARCH ARTICLE



# Effect of Acupuncture on Pain and Quality of Life in Patients with Lumbar Spinal Stenosis: A Case Series Study

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## Abstract

Lumbar spinal stenosis (LSS) is a major cause of debilitation in adults, and acupuncture is a recommended treatment. We assessed the effect of acupuncture on pain and quality of life in patients with LSS. Twenty-four patients with LSS who had symptoms of neurogenic claudication were randomly selected and underwent 10 sessions of acupuncture. Pain and quality of life were evaluated before and immediately after the intervention and 6 weeks later using a visual analogue scale and Short Form-36 Health Survey. Paired *t* tests and repeated measure tests were used to analyze the data. The mean age of the patients was  $48.2 \pm 10.8$  years. The mean visual analogue scale scores before and immediately after intervention ( $7.9 \pm 1.3$  and  $4.3 \pm 2.1$ ) were statistically different ( $p < 0.001$ ), as was the mean score ( $3.08 \pm 2.3$ ) 6 weeks later ( $p = 0.01$ ). Five aspects of the Short Form-36 Health Survey score were associated with significant improvements immediately after acupuncture ( $p < 0.05$ ). Comparisons of the scores before and 6 weeks after intervention

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showed significant improvements in emotions, vitality, general health, bodily pain, and physical well-being. Therefore, acupuncture had a significant short-term effect on pain and quality of life in patients with LSS.

## 1. Introduction

Lumbar spinal stenosis (LSS) refers to an anatomic condition that includes narrowing of the intraspinal (central) canal, lateral recess, and/or neural foramina [1,2]. Spondylosis, or degenerative arthritis affecting the spine, is the most common cause of LSS, which typically affects individuals older than 60 years [3]. LSS is a cause of disability in the aging population. Other acquired causes include tumors, postoperative adhesion, skeletal disease (Paget's, ankylosing spondylitis), and spinal dysraphisms.

Mechanical compression and ischemia of the nerve roots have been proposed as the causes of the neurologic symptoms in LSS. Either or both of these mechanisms may operate in individual patients. The role of inflammation of the nerve roots is less certain [4–6]. Neurogenic (or pseudo) claudication is a hallmark of LSS. This is the tendency for symptoms, usually pain, to be exacerbated with walking, standing, and/or maintaining certain postures, and relieved with sitting or lying [7]. The primary symptoms of LSS include discomfort, sensory loss, and weakness in the legs, reflecting the involvement of the spinal nerve roots within the lumbar spinal canal. In general, a trial of conservative, nonsurgical treatment precedes surgical treatment. Nonsurgical treatments used for LSS include physical therapy [8–10]; analgesic, anti-inflammatory and anticonvulsant medications [11,12]; and epidural steroid injections [13–15]. Many patients suffer from the symptoms even while using all of the above mentioned treatments repeatedly. Patients with progressive neurologic deficits, especially cauda equina syndrome, may need urgent surgical decompression [16,17]. There may be a chance of recurrence of symptoms even after surgery and none of the treatments is curative.

Acupuncture is a type of complementary and alternative medicine. It has been accepted worldwide mainly for treatment of acute and chronic pain. Studies on the mechanisms of action have revealed that endogenous opioid peptides in the central nervous system play an essential role in mediating the analgesic effect of electroacupuncture (EA) [18]. A study by Kasuya et al [19] found that acupuncture is an effective treatment strategy for canal stenosis. Also, Wang [20] showed that the therapeutic effect of EA on the senile radical sciatica is significantly better than transcutaneous electrical nerve stimulation. The aim of this study was to evaluate the effect of acupuncture on pain and quality of life in patients with canal stenosis.

## 2. Materials and methods

### 2.1. Setting and sampling

This study was designed to evaluate the effect of acupuncture on pain and quality of life in patients with

canal stenosis who were referred to physiatry clinics between September 2009 and September 2010 at three major teaching hospitals in Shiraz, Iran. Twenty-four patients with symptoms of neurogenic claudication whose disease was confirmed by imaging or electrodiagnosis were randomly selected.

Inclusion criteria were patients with LSS and symptoms of neurogenic claudication for at least 6 months that did not respond to medication or physical therapy, or had not already experienced acupuncture for this condition. Exclusion criteria were having diabetes mellitus, brucellosis, severe hip/knee osteoarthritis or accompanying peripheral neuropathy, and severe diseases that needed surgery (cauda equina syndrome or progressive neurologic deficit).

### 2.2. Ethical consideration

The study was approved by the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran. Before enrolment, patients received detailed written and verbal information regarding the aims of the study. Patients completed the questionnaire during or before acupuncture sessions. A trained research assistant provided them with help if necessary.

### 2.3. Acupuncture intervention

Acupuncture (traditional Chinese medicine style) was used as an alternative treatment method in patients based on inclusion and exclusion criteria. Points were selected based on previous studies [19,20] and the clinicians' personal experience. Twenty-three needle insertions were done per patient per session. The acupoints used included bilateral BL-23, BL-25, BL-26, BL-37, BL-40, BL-54, BL-57, LI-4, BL-60, DU-3, DU-4, and DU-20; the depth of insertion was 2.5–5 cm in the muscle and intradermal in DU-20. The acupuncture protocol was the same for all the patients. According to the needle type, metal needle size was 25 × 25 mm or 40 mm (Dong Bang, Shangdong, China). Each patient was recruited for 10 sessions of acupuncture. There were three sessions per week and the needles remained in the points for 30 minutes (retention time). Patients did not receive other treatments in the course of acupuncture and no control group was used. The practitioner (A.L.) was resident of physical medicine and rehabilitation at the time of the study and had 3 years of acupuncture experience. He used sterility and acupuncture was performed in a quiet and comfortable location and the patients were instructed about mild drowsiness, mild pain, or bleeding at the site of acupuncture.

### 2.4. Measurement tool

Pain and quality of life were evaluated using a visual analogue scale (VAS) and Short Form-36 Health Survey

(SF-36) before and immediately after the intervention and also 6 weeks after it. The VAS is a horizontal line and is determined by measuring in mm from the left hand end of the line to the point that the patient marks. The SF-36 is multipurpose and consists of eight scales: physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, and mental health. Each scale can be measured using a 0–100 scoring system.

## 2.5. Sample size

According to sample size calculation formula for comparison of the means in the two groups and assuming  $d = 0.01$ ,  $\alpha = 0.05$ , and  $\beta = 0.2$ , the sample size of 24 patients was calculated.

## 2.6. Statistical analysis

The statistical analysis of the data was performed using SPSS version 15 (SPSS Inc., Chicago, IL, USA). The results related to the continuous variables are presented as mean  $\pm$  standard deviation, median, and interquartile range (25–75%), and those related to the quantitative or categorical data are shown as percentage and frequency. Statistical analyses were performed using paired *t* test and repeated measure test and  $p < 0.05$  was considered as statistically significant.

## 3. Results

Initially, 28 patients were enrolled in the study but four did not continue the acupuncture sessions. Two of them left as they were from rural areas and could not attend because of the long distance, and two left for unknown reasons. Finally, 24 patients were enrolled in the study and no patient was lost in the follow-up process.

There were 10 (41.7%) men and 14 (58.3%) women enrolled in this study. The mean age of the patients was  $48.2 \pm 10.8$  years. Demographic, social, and clinical characteristics of the study patients are shown in Table 1. In this study, 14 (58.3%) patients were married and 16 (66.6%) patients had diploma or lower education. Twelve (50.0%) patients had used nonsteroidal anti-inflammatory drug as the treatment for their condition. The mean VAS score in patients before the intervention was  $7.9 \pm 1.3$  and  $4.3 \pm 2.1$  immediately after, which showed a significant decrease ( $p < 0.001$ , 95% confidence interval = 0.63–2.46, mean difference = 2.06). The mean score 6 weeks later was  $3.08 \pm 2.3$ , which was also significant ( $p = 0.01$ , 95% confidence interval = 0.30–0.19, mean difference = 2.58). Muscle twitch response was usually observed after the intervention. There were no major complications in our study. Two patients reported minor irritation and redness at the sites of acupuncture, which was self-limited.

In the assessment of the quality of life, there were eight aspects. Five aspects of SF-36 score including emotional role, general health, physical role, social functioning, and mental health were associated with significant ( $p < 0.05$ ) improvements immediately after acupuncture. However, the comparison of scores before the intervention and 6

**Table 1** Demographic, social and clinical characteristics of the study patients

| Variable                             | Study population<br>( <i>n</i> = 24) |
|--------------------------------------|--------------------------------------|
| Age (y)                              | 48.2 $\pm$ 10.8                      |
| Sex                                  |                                      |
| Female                               | 14 (58.3)                            |
| Male                                 | 10 (41.7)                            |
| Material status                      |                                      |
| Single                               | 6 (25.0)                             |
| Married                              | 14 (58.3)                            |
| Others (divorced, widowed, etc.)     | 4 (16.7)                             |
| Education                            |                                      |
| Under diploma                        | 8 (33.3)                             |
| Diploma                              | 8 (33.3)                             |
| University graduated                 | 6 (25.0)                             |
| Missing                              | 2 (8.3)                              |
| Severity of the condition            |                                      |
| Mild (VAS < 6)                       | 3 (12.5)                             |
| Moderate (VAS 6–8)                   | 8 (33.3)                             |
| Severe (VAS > 8)                     | 13 (54.2)                            |
| Previous treatment for the condition |                                      |
| NSAID                                | 12 (50.0)                            |
| Physical therapy                     | 8 (33.3)                             |
| None or missing                      | 4 (16.7)                             |

Data are presented as *n* (%) or mean  $\pm$  standard deviation. NSAID = nonsteroidal anti-inflammatory drug; VAS = visual analogue scale; y = year.

weeks later showed significant improvements in five aspects including emotional role, vitality, general health, bodily pain, and physical functioning. All details are shown in Tables 2 and 3 and Fig. 1.

## 4. Discussion

In our study, acupuncture was associated with improvement of pain in patients with lumbar canal stenosis and the effect was persistent 6 weeks after the intervention. Acupuncture was also associated with improvement of quality of life immediately after and 6 weeks later; however, there were some limitations in our study. First of all, as we did not use a control group, it was not possible to judge success attributable to the acupuncture intervention. Second, some patients may have improved due to passage of time, expectation, or other factors. We followed the patients for only 6 weeks and long-term effects of acupuncture are unknown.

A systematic review by Kim et al [21] identified six studies in China about the effects of acupuncture in patients with canal stenosis and found no conclusive evidence of the effectiveness and safety of acupuncture for LSS because of high or uncertain risk of bias and the limited generalizability of the included studies. Systemic reviews showed that for chronic low back pain, there is evidence of short-term pain relief and functional improvement for acupuncture compared to no treatment or sham therapy [22,23]; this is in accordance with our results. Also, Wang [20] concluded that the therapeutic effect of EA on the

**Table 2** Comparison of Short Form-36 Health Survey (SF-36) score before and immediately after acupuncture in canal stenosis patients

| Scores of SF-36 |                      | Time                |                   |                 |          |       |      |
|-----------------|----------------------|---------------------|-------------------|-----------------|----------|-------|------|
|                 |                      | Before intervention | Immediately after | Mean difference | <i>p</i> | CI    |      |
| 1               | Role emotional       | 47.2 ± 9.7          | 65.2 ± 7.3        | 2.07            | 0.001    | 0.63  | 2.46 |
| 2               | Vitality             | 48.0 ± 6.1          | 48.5 ± 5.3        | 0.08            | 0.760    | -0.67 | 0.92 |
| 3               | General health       | 44.4 ± 5.3          | 55.7 ± 4.9        | 2.21            | 0.001    | 0.53  | 2.32 |
| 4               | Bodily pain          | 47.8 ± 4.9          | 47.8 ± 6.7        | 0.08            | 1.000    | -0.80 | 0.80 |
| 5               | Physical functioning | 44.8 ± 5.1          | 44.6 ± 6.2        | 0.03            | 0.900    | -0.74 | 0.85 |
| 6               | Role physical        | 62.5 ± 5.2          | 83.3 ± 9.1        | 2.80            | 0.001    | 0.63  | 2.46 |
| 7               | Social functioning   | 63.0 ± 7.1          | 52.6 ± 4.8        | 1.71            | 0.001    | 0.63  | 2.48 |
| 8               | Mental health        | 44.8 ± 4.7          | 49.5 ± 6.0        | 0.87            | 0.004    | 0.43  | 2.19 |

Data are presented as mean ± standard deviation, unless otherwise indicated. CI = confidence interval.

**Table 3** Comparison of Short Form-36 Health Survey (SF-36) score before and 6 weeks later in canal stenosis patients

| SF-36 scores |                      | Time                |            |                 |          |       |      |
|--------------|----------------------|---------------------|------------|-----------------|----------|-------|------|
|              |                      | Before intervention | 6 wk later | Mean difference | <i>p</i> | CI    |      |
| 1            | Role emotional       | 47.2 ± 9.7          | 63.8 ± 5.6 | 2.09            | 0.001    | 0.63  | 2.46 |
| 2            | Vitality             | 48.0 ± 6.1          | 62.9 ± 8.3 | 2.04            | 0.001    | 0.63  | 2.51 |
| 3            | General health       | 44.4 ± 5.3          | 53.3 ± 4.8 | 1.76            | 0.001    | 0.53  | 2.32 |
| 4            | Bodily pain          | 47.8 ± 4.9          | 69.0 ± 5.3 | 4.15            | 0.001    | 0.63  | 2.44 |
| 5            | Physical functioning | 44.8 ± 5.1          | 49.8 ± 4.9 | 0.99            | 0.001    | 0.63  | 2.51 |
| 6            | Role physical        | 62.5 ± 5.2          | 61.4 ± 5.4 | 0.20            | 0.47     | -0.50 | 1.10 |
| 7            | Social functioning   | 63.0 ± 7.1          | 66.1 ± 6.9 | 0.44            | 0.13     | -0.17 | 1.46 |
| 8            | Mental health        | 44.8 ± 4.7          | 46.2 ± 5.7 | 0.26            | 0.35     | -0.41 | 1.19 |

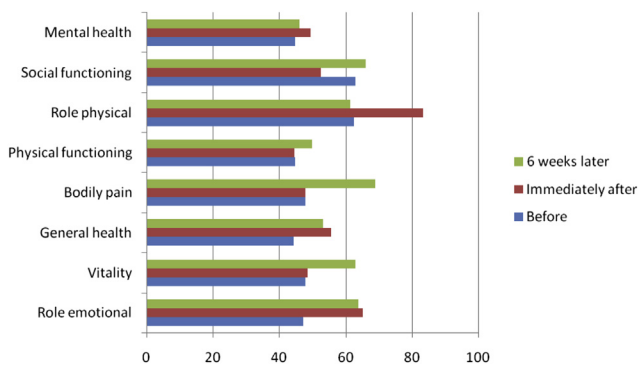
Data are presented as mean ± standard deviation. CI = confidence interval; wk = week.

senile radical sciatica is significantly better than transcutaneous electrical nerve stimulation. A study by Inoue et al [24] in 2012 showed spinal nerve root stimulation by EA improved pain, limb symptoms, and walking distance in patients and the effect was persistent after 3 months; however, their technique was different from that of our study.

Different mechanisms have been proposed for the efficacy of acupuncture in canal stenosis. The effect of

acupuncture on pain relief could be due to induction of endogenous opioids release in the brain-stem, and subcortical and limbic structures [25,26]. Chen et al [27] concluded that acupuncture can relieve the symptoms of the sciatica with an increase in pain threshold. Inoue et al [28] concluded that one mechanism of action of acupuncture and EA stimulation could be, in addition to its influence on the pain inhibitory system, a transient change in the sciatic nerve blood flow, including circulation to the cauda equina and nerve roots.

Patients with canal stenosis are usually old with multiple concomitant diseases and usually use many drugs, so taking additional drugs for this disease is often not suitable, because of drug side effects and interactions. Moderate and high-quality evidence for nonoperative treatment for canal stenosis is lacking, thus prohibiting recommendations for guiding clinical practice [29]. Acupuncture is a low-cost treatment with no major complication, although care should be taken when performing deeper needling to avoid infection or unintentional organ penetration. As the long-term effects of acupuncture are uncertain, high quality studies with more extensive follow up are suggested. Also, additional research for different acupuncture methods and stimulations and combination of acupuncture with other nonsurgical treatments seem necessary. Future trials using rigorous methodology, appropriate comparisons, and clinically relevant outcomes are recommended.



**Figure 1** Comparison of Short Form-36 Health Survey score before the intervention, immediately after, and 6 weeks later in canal stenosis patients.

## Disclosure statement

The author declares to have no conflicts of interest and no financial interests related to the material of this manuscript.

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