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## Can Spinal Manipulation Be Used as an Effective Method to Reduce Pain for Patients with a Lumbar Disc Herniation Compared to Traditional Methods?

Aaron Blady

*Philadelphia College of Osteopathic Medicine*

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**Can Spinal Manipulation Be Used as an Effective Method to Reduce  
Pain for Patients with a Lumbar Disc Herniation Compared to  
Traditional Methods?**

Aaron Blady, PA-S

A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies  
Philadelphia College of Osteopathic Medicine  
Philadelphia, Pennsylvania

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## ABSTRACT

**OBJECTIVE:** The objective of this selective EBM review is to determine whether or not “can spinal manipulation be used as an effective method to reduce pain for patients with a lumbar disc herniation compared to traditional methods?”

**STUDY DESIGN:** A systematic review of one randomized controlled trial, one randomized controlled pilot study, and one double-blind, randomized control trial published in 2010 and after. All studies were published in English.

**DATA SOURCES:** Data sources for this review were articles published in peer-reviewed journals using PubMed Database.

**OUTCOME(S) MEASURED:** The outcome measured was change in pain. This was accomplished by using a Numeric Analog Scale (NAS), Aberdeen Back Pain Scale, and a Visual Analogue Pain Scale (VAS).

**RESULTS:** McMorland et al. proved that spinal manipulation was effective in decreasing pain and should be considered for patients prior to resorting to surgery. This study was statistically significant ( $P=0.034$ ). Lopez- Diaz et al. proved that spinal manipulation was effective in decreasing pain and was significantly more successful than traditional physiotherapy techniques ( $P = 0.004$ ). Demirel et al. found that spinal manipulation can be used as an assistive agent with traditional physiotherapy methods but that there was no significant reduction in pain between groups. No statistical significance was noted in this study. ( $P =0.789$ ).

**CONCLUSION:** While reduction of pain from baseline was noted in all three studies based on decrease in mean change from baseline, statistical significance was not noted in Demirel et al. Furthermore, each studies recommendation on when to implement spinal manipulation varied. Thus, the results of this review are inconclusive. Further research with a larger sample size is warranted to determine the benefits of spinal manipulation

**KEY WORDS:** Lumbar disc herniation, musculoskeletal manipulation

## **INTRODUCTION**

A lumbar disc herniation (LDH) occurs due to a desiccation or tear in the annulus fibrosis of an intervertebral disc causing the nucleus pulposus to bulge outward. It is most often due to bending or heavy lifting with the back in flexion but can also occur due to degenerative disc diseases. Pain due to an LDH is very common in the United States. Approximately 5 to 20 per 1000 adults annually are diagnosed with a LDH, with it being most common in male patients between 30 and 50 years old.<sup>1</sup> The estimated annual cost of lower back pain in the USA surpasses \$100 billion with lumbar disc herniation as its leading source.<sup>2</sup> The most common surgical procedure for a LDH is a discectomy and in the United States alone, greater than 250,000 lumbar discectomies are performed annually. As a result of prevalence, physician demand is growing. Physician assistants have the ability to decrease the workload placed on physicians by accurately evaluating, diagnosing, treating, and educating patients who suffer from a lumbar disc herniation.

The primary symptoms of a LDH include lower back pain, radicular pain, and sensory abnormalities that are often worse with the back in flexion and prolonged sitting. Specific symptoms vary depending on the spinal level of the herniation. For a patient that presents with these symptoms, a LDH can be confirmed with an MRI. The mechanism of a lumbar disc herniation is well understood but currently, there are no universally recognized guidelines for the management of a LDH, just a variety of recommended regimens.<sup>3</sup>

For some patients, their LDH will spontaneously regress without treatment. Unfortunately, this does not hold true for everyone. The current methods and regimens for treating a LDH consists of medications, physiotherapy, and surgery, all of which can be used independently but are more commonly used as a combination. Common medications include

NSAIDS and corticosteroids, the latter of which may be given orally, epidurally and transforaminally. Common physiotherapy techniques include stabilization exercises, massage, and electrical or thermal stimulation. The most common surgical procedure is a microdiscectomy, which is usually reserved if nonsurgical options have failed.

The treatment options listed above have not been shown to be a definitive treatment. In fact, it is estimated that one year after nonsurgical treatment, the incidence of pain recurrence is over 40%.<sup>1</sup> The method of treatment being proposed is physical manipulation of the spine. Similar to physical therapy, spinal manipulation is a noninvasive technique that focuses on pain management. The key difference between the two is that physical therapy focuses on exercise and stretching while chiropractic techniques use manipulation and adjustment to achieve its goal. This paper evaluates three randomized controlled trials (RCTs) to determine if spinal manipulation can be used as a viable treatment option to reduce pain in patients who suffer from a lumbar disc herniation.

## **OBJECTIVE**

The objective of this selective EBM review is to determine whether or not spinal manipulation can be used as an effective method to reduce pain for patients with a lumbar disc herniation compared to traditional methods.

## **METHODS**

The key words for searching articles were “intervertebral disc displacement” and “musculoskeletal manipulations”. All three articles were published in English and in peer reviewed journals. Articles were researched in PubMed based on relevance to the clinical question and were measured by Patient-Oriented Evidence that Matters (POEMS).

Inclusion criteria for the search consisted of whether the study was an RCT and published in 2010 or after. Exclusion criteria consisted of articles published earlier than 2010, animal trials, and languages other than English. All three articles evaluated the treatment effect using p values and the mean change from baseline. Table 1 shows the demographics and characteristics of the included studies.

The population of interest includes patients over the age of 18 with pain due to a lumbar disc herniation. The outcome measured was pain, which was measured by using a Numeric Analog Scale (NAS), Aberdeen Back Pain Scale, and a Visual Analogue Pain Scale (VAS) of the lower back.

This analysis reviewed one randomized controlled trial, one randomized controlled pilot study, and one double-blind, randomized control trial that examined spinal manipulation as an intervention for pain reduction in patients that suffered from a lumbar disc herniation. McMorland et al. compared spinal manipulation with microdiscectomy. Lopez-Diaz et al. compared spinal manipulation with standard physical therapy techniques such as stabilization exercises, muscle stretching, massage, thermotherapy, and electrotherapy. Demirel et al. compared standard physical therapy techniques with standard physical therapy techniques coupled with spinal manipulation.

## **OUTCOMES MEASURED**

The outcome measured in all three studies looked at pain alleviation based on the subject's improvement after spinal manipulation. Demirel et al. measured pain using a Numeric Analog Scale (NAS). Patients were instructed to verbally rate their pain where 0 indicates no pain and 10 means unbearable pain.<sup>4</sup> This was measured at rest, during activities, and at night.<sup>4</sup> Patients were followed for three months.<sup>4</sup> Lopez-Diaz et al. measured pain using a Visual

**Table 1. Demographics & Characteristics of included studies**

Study	Type	#Pts	Age (yrs)	Inclusion Criteria	Exclusion Criteria	W/D	Intervention
Demirel <sup>1</sup> 2017	RCT	40	25 – 65	Patients diagnosed with a lumbar disc herniation (LDH), with mild or moderate disc degeneration that had ongoing pain $\geq$ 8 weeks	Patients that were asymptomatic, had musculoskeletal or neurologic disorders, $\geq$ 3 herniations, a ruptured PLL and sequestered herniation, or previously undergone spine surgery	20	Electrotherapy, deep friction massage, and stabilization exercise plus non-surgical spinal decompression VS Electrotherapy, deep friction massage, and stabilization exercise
McMorland <sup>2</sup> 2010	RCT	40	> 18	English speaking patients with unilateral lumbar radiculopathy secondary to a LDH with leg dominant symptoms. Patients must have failed $\geq$ 3 months of nonoperative conservative management.	Patients that presented with radicular symptoms for < 3 months, had previous spine surgery, currently pregnant, had prolonged use of systemic corticosteroids, or any patient with a musculoskeletal, hemorrhagic, or neurologic disorders.	0	Surgical microdiscectomy VS Spinal manipulation
Lopez-Diaz <sup>3</sup> 2014	RCT	30	31-63	Diagnosed LDH with back pain, radicular pain with neurologic deficit, and limited ROM	Treated with corticosteroids, previous lumbar surgery, or any musculoskeletal, neurologic or pain masking disorders	0	Conservative measures (electrotherapy, muscle stretching, and thermotherapy) VS Spinal manipulation

Analogue Pain Scale (VAS), completed by patients before and after each session over the course of three weeks.<sup>5</sup> McMorland et al. rated pain using the Aberdeen Back Pain Scale where 0 indicated no pain and 100 indicated unbearable pain. Patients were contacted at 3, 6, 12, 24, and 52 weeks after treatment was initiated.<sup>3</sup>

## RESULTS

All three studies were randomized control studies which utilized continuous data that could not be converted into dichotomous data. The population of the studies included patients aged 18 to 65 who were diagnosed with a lumbar disc herniation. Further inclusion and exclusion criteria for each study can be found in Table 1.

Demirel. et al. conducted a double-blind, randomized controlled trial involving 40 patients. Patients were randomized into two treatment groups, 20 patients in the control group (CG) and 20 patients the study group (SG).<sup>4</sup> The randomization allocation was concealed from those enrolling the subjects into the study. Both CG and SG received a combination of electrotherapy modalities, deep friction massage, and stabilization exercises for fifteen session.<sup>4</sup> For SG, non-invasive spinal decompression therapy was also applied during the first ten sessions.<sup>4</sup> During the intervention phase and the follow up phase, 10 patients were lost from SG and 10 patients were lost from CG due to unspecified reasons.<sup>4</sup> Pain intensity was measured using the Numeric Analog Scale (NAS) during any activity, at night, and while resting from the onset of treatment to three months following the last treatment.<sup>4</sup> The CG showed a decrease in mean values of  $7.8 \pm 2.5$  before treatment to  $0.8 \pm 1.1$  after treatment, with a mean change from baseline value of 7.0.<sup>5</sup> The SG showed a decrease in mean value of  $6.5 \pm 2.7$  before treatment and  $0.9 \pm 1.6$  after treatment, resulting in a mean change from baseline value of 5.6.<sup>5</sup> Although

both groups showed a decrease in pain, the p-value of 0.789 indicates there was no statistically significant difference and that the estimate of treatment effect is not precise.<sup>4</sup>

**Table 2: Numeric Pain Scale Mean  $\pm$  SD change in Pain from Baseline and three Months Follow-Up and Statistical Significance (data from Demerial et al.)<sup>5</sup>**

	Before treatment (Mean $\pm$ SD)	3 months after treatment (Mean $\pm$ SD)	Mean Change from Baseline (calculated)	P-value
<b>Control Group (n =10)</b>	7.80 $\pm$ 2.50	0.8 $\pm$ 1.10	7.00	0.789
<b>Study group (n=10)</b>	6.50 $\pm$ 2.70	0.9 $\pm$ 1.60	5.60	

McMorland et al. compared the efficacy of spinal manipulation against microdiscectomy for patients with radiculopathy secondary to LDH. Forty patients were randomly split into two treatment groups, 20 to receive spinal manipulation and 20 to receive a microdiscectomy.<sup>3</sup> Patients in the spinal manipulation group received an average of 21 sessions and 6 supervised rehabilitation session over 52 weeks.<sup>3</sup> Patients in the surgical group received a single microdiscectomy procedure followed by six supervised rehabilitation sessions over the course of 52 weeks.<sup>3</sup> At the end of week 12 (intention to treat period), eight of the twenty patients from the spinal manipulation group showed no improvement and crossed over to the surgery group over the course of three months.<sup>3</sup> Of the 20 from the surgery group, three failed to show improvement at the end of week 12 and crossed over to the spinal manipulation group over the course of six to eight months.<sup>3</sup> After treatment was initiated, patients rated their pain using the Aberdeen Back Pain Scale on week 3, 6, and 12. The surgical group showed a decrease in mean value from 45.1 before treatment and 25.8 at 12 weeks, with a mean change from baseline value of 19.3.<sup>3</sup> The spinal manipulation group showed a decrease in mean value from 44.7 before treatment and 35.6 at 12 weeks, with a mean change from baseline value of 9.1.<sup>3</sup> The eight patients from the spinal manipulation group who crossed over to surgery showed improvement to the same a degree as

the primary surgical counter parts. However, the three patients from the surgery group who crossed over to spinal manipulation failed to show any improvement. This study revealed that pain was decreased for patients in both groups; however, surgery proved to be more effective ( $P < 0.05$ ; Table 3).<sup>3</sup>

**Table 3 – Aberdeen Back Pain Scale expressed as a mean (intention-to-treat over 12-week period) and Statistical Significance (data from McMorland et al.)<sup>4</sup>**

	Baseline (Mean SD)	3 wk (Mean SD)	6wk (Mean SD)	12 wk (Mean SD)	Mean Change from Baseline (calculated)	P- value
<b>Surgery</b>	45.10	38.00	32.30	25.80	19.30	0.034
<b>Chiropractic</b>	44.70	37.50	34.80	35.70	9.10	

Lopez-Diaz JV et al. conducted a triple-blind, randomized controlled pilot study analyzing the efficacy of manual oscillatory therapy using the Pulsation Oscillation Long Duration technique (POLD) compared to usual treatment for acute LDH. Thirty patients were chosen for this study based on the criteria listed in Table 1.<sup>5</sup> Patients were randomly divided into two homogenous groups to receive usual treatment or treatment with the POLD technique.<sup>5</sup> No patients were lost during this study. The conservative treatment group received 9 sessions of microwave therapy of the lower back, analgesic electrotherapy of the lower back, and self-directed muscle stretching exercises during each session.<sup>5</sup> The POLD group received 9 sessions of a series of maneuvers in the prone position: rhythmic oscillation of the spine, transverse rhythmic mobilization of the lumbar and paravertebral muscles, oscillatory spinal decompression from the sacrum, lateral opening of the affected level by oscillatory inclination and symmetric oscillatory rotation at the vertebrae of the affect level.<sup>5</sup> At the end of each session, patients measured their pain severity using a visual analogue pain scale (VAS). The control group

showed a decrease in mean value from  $5.33 \pm 2.22$  before treatment to  $4.47 \pm 1.79$  after 9 sessions, with a mean change from baseline value of 0.86. The POLD group showed a decrease in mean value from  $5.09 \pm 3.21$  before treatment to  $0.79 \pm 1.60$  after 9 session, with a mean change from baseline value of 4.30. When comparing both interventions, POLD showed a greater change from the initial assessment and proved to be statistically significant with a p-value of 0.004.<sup>5</sup> This indicates the estimate of treatment effect is precise.

**Table 4 – Lumbar VAS Mean  $\pm$  SD Change in Pain from Baseline and 9 Session Follow-up and Statistical Significance (data from Lopez-Diaz et al.)<sup>6</sup>**

	Initial Assessment (Mean $\pm$ SD)	Final Assessment (Mean $\pm$ SD)	Mean Change from Baseline (calculated)	P-value
<b>Control</b>	$5.33 \pm 2.22$	$4.47 \pm 1.79$	0.86	0.004
<b>POLD</b>	$5.09 \pm 3.21$	$0.79 \pm 1.60$	4.30	

## DISCUSSION

A herniated disc can cause pain, numbness, and radicular tingling. Pain related symptoms may improve in a couple of weeks due to spontaneous regression<sup>4</sup>, but for some patient's, other treatment modalities are necessary. Currently, there is no universally recognized guidelines for the management of a herniated disc, just a variety of recommended treatments.<sup>3</sup> This systematic review investigates pain reduction from the current recommended treatments and compares them to the use of spinal manipulation. Demerial et al showed no superiority between groups regarding pain reduction and concluded that spinal manipulation should only be used as an assistive agent with other physiotherapy methods. However, this studies p value was 0.789 indicating that there was no statistically significant difference between groups. On the other hand, Lopez et al. and McMorland. et al. demonstrate statistical significance in the improvement of pain, indicating that spinal manipulation may play a role in in pain reduction for LDH.

A limitation noted in all three studies was the small sample size. Lopez et al. used a sample size of 30, McMorland et al used a sample size of 40, and Demirel only involved 20 patients in the study. Another limitation stems from the fact that in some instances, a LDH will spontaneously heal regardless of treatment. It is difficult to determine if this occurred in any of these studies. A limitation specific to the Lopez et al. study was the short duration. This entire study took place over the course of three weeks and did not involve any long-term follow ups.

Finally, personal bias is difficult to eliminate from this study as patients were not blinded to the treatment they received. It was not discussed in any of the studies if patients had any preconceived notions on spinal manipulation.

Serious adverse events caused by spinal manipulation are rare.<sup>6</sup> Ironically, the most common adverse event reported is a disc herniation.<sup>6</sup> Other potential complications include cauda equina syndrome and vascular dissection.<sup>6</sup> For this reason, spinal manipulation is contraindicated in patients at risk for a vascular dissection<sup>7</sup>. This includes patients with Ehlers-Danlos syndrome type IV, prior history of vascular dissection, TIA symptoms, and recent trauma.<sup>6</sup> Other risk factors for potential adverse events include bleeding disorders, inflammatory spondyloarthropathy, osteoporosis, down syndrome, aortic aneurysm and dissection, and chronic anticoagulation.<sup>6</sup> All these factors must be taken into consideration when determining if spinal manipulation is appropriate for a patient.

## **CONCLUSION**

All three randomized control trials provided evidence that spinal manipulation can be an effective method for reducing pain in patients with a lumbar disc herniation, but each trials recommendation is conflicting. Demirel et al. found that spinal manipulation shows no superiority compared to conservative methods but that incorporating spinal manipulation in

conjugation with physiotherapy methods may be beneficial in reducing pain.<sup>4</sup> McMorland et al. found that only patients who have failed conservative management for a LDH, should consider spinal manipulation before resorting to surgery.<sup>3</sup> Finally, Lopez et al. found the spinal manipulation is more effective than conservative methods in reducing pain in LDH patients with sciata.<sup>5</sup>

A lumbar disc herniation is a common, painful, and potentially costly condition that will continue to affect individuals and distress the health care system. Future trials with larger sample sizes and longer follow ups need to be proposed to determine the true efficacy of spinal manipulation and its role in relieving pain in those that suffer from a lumbar disc herniation.

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