JOURNAL OF CONTEMPORARY CHIROPRACTIC

CONTRALATERAL NEURODYNAMIC MOBILIZATION IN THE REDUCTION OF POST-OPERATIVE LEG PARESTHESIA: A CASE REPORT

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ABSTRACT

Objective: To describe a therapeutic effect using contralateral neurodynamic mobilization and to discuss multimodal management involving manual therapy, neurodynamic mobilization, and exercise in the management of chronic leg paresthesia following lumbar microdiscectomy.

Clinical Features: A 61-year-old male sought chiropractic care for episodic low back pain and persistent left-sided lower leg paresthesia. Symptoms began 20 years prior following lumbar microdiscectomy for a disc herniation. Post-operatively, lower leg and foot paresthesia remained unchanged for 20 years despite non-pharmacologic interventions.

Intervention and Outcome: Chiropractic management included repeated end-range loading, bilateral neurodynamic mobilization exercises, and spinal manipulative therapy of the lumbar spine for 15 visits over 3 months. The patient reported paresthesia symptoms shifting from constant to intermittent to full resolution of leg and foot paresthesia over a course of 15 sessions. Long term follow up at 9.5 months indicated significant improvement of leg paresthesia and continued prophylaxis with performance of exercises.

Conclusion: This case describes non-pharmacological management of persistent leg and foot paresthesia following lumbar spine microdiscectomy. End-range loading, bilateral neurodynamic mobilization exercises, and spinal manipulative therapy of the lumbar spine resolved symptoms in this case. *(J Contemporary Chiropr 2024;7:51-56)*

Key Indexing Terms: Distal Paresthesia; Spinal Manipulation; Chiropractic; Manual Therapy; Neurodynamic Exercise; Nerve Mobilization

INTRODUCTION

Low back pain (LBP) has become a personal, public, and financial challenge, due to its multifactorial nature and low specificity of diagnostic methods (imaging, injections, etc.). (1,2) LBP is largely considered non-specific (3); however, with the presence of radicular leg pain, it allows for a more specific diagnosis. (4) Radicular LBP can have multiple causes but is most often associated with herniated nucleus pulposus (HNP) and/or spinal stenosis. (2) The presence of HNP does not always result in pain; however, radicular pain due to HNP ranges between 2- 4% and is more common in men between the ages of 30 years and 50 years. (2)

Clinical practice guidelines recommend initially selecting non-pharmacological management for lumbar radicular symptoms due to symptomatic HNP (5); when symptoms are too severe or are non-responsive, lumbar discectomy may be considered. (6,7) Postoperatively,

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patients often experience leg pain, numbness or paresthesia which generally diminishes between 6 weeks and 10 months. (8,9) Low back and/or leg pain reoccurrence following lumbar discectomy, also known as failed back surgery syndrome, is common with rates between 29-65% within 3 years. (10,11) The risk of reoccurrence is multifactorial and higher in patients with large versus small annular defects following lumbar discectomy, extensive epidural fibrosis, and whose symptoms do not completely abolish post-operatively. (11-13)

Despite recommendations for use of active rehabilitation post-operatively, patients are inconsistently provided this option. (14) Little is known about manual therapy efficacy and management for symptoms following lumbar discectomy outside of reports from lower-level evidence (case reports, series, etc.). (15) A systematic review by Daniels et al suggests manual therapy may have a positive effect in individuals with a prior history of lumbar surgery; however, this recommendation cannot be generalized. (15)

Neurodynamic mobilization is a manual therapy technique consisting of nerve flossing/gliding and/or nerve tensioning. (16, 17) When used diagnostically, neural tension tests are sensitive and can be helpful in the diagnosis of lumbosacral radiculopathies. (18) The exact mechanisms for pain generation are unknown, but symptoms may be related to decreased blood flow, nerve tensioning, compression, or irritation. (19) Several studies have quantified caudal migration of the spinal cord with dural tension maneuvers performed unilaterally and bilaterally in asymptomatic individuals. (20-23) Bilateral dural tension procedures nearly doubled the cord excursion when compared with unilateral movements alone. (20-22) Further, contralateral dural tension procedures during slump's test have been shown to reduce ipsilateral evoked sensations (posterior thigh stretch) in asymptomatic individuals. (23) Our case study is an early report of this neural crossover mechanism by using contralateral neurodynamic movements therapeutically.

The purpose of this case report is to describe a therapeutic effect involving contralateral neurodynamic mobilization exercises and to discuss multimodal management that includes manual therapy, neurodynamic mobilization, and exercise in the management of chronic leg paresthesia following lumbar microdiscectomy.

CASE REPORT

History: A 61-year-old male sought chiropractic care for episodic neck and LBP with persistent left-sided lower leg paresthesia. Symptoms began 20 years prior following an acute episode of LBP with associated radicular symptoms into the left leg. The patient did not respond to physical therapy, personal training, vertebral traction, and chiropractic care before consulting a neurosurgeon and obtaining an MRI. He underwent a partial lumbar microdiscectomy in 2002, which successfully reduced the low back and left radicular leg pain, however, persistent lateral foot paresthesia consistent with the S1 dermatome (3rd, 4th, and 5th digits and dorsal aspect of lateral foot) remained. Following the post-surgical period, he slowly returned to regular activities and accepted persistent foot paresthesia as a surgical side effect. Over the following 20 years, foot paresthesia remained constant with intermittent episodes of paresthesia on the lateral calf and plantar aspect of the foot that would accompany back pain episodes.

Current Presentation: The patient reported LBP as 3/10 with rest, and 4/10 with physical activity, per a Numeric Rating Scale (NRS). The frequency of leg paresthesia was constant and was described as aching with numbness. Provocative factors included sustained sitting and increases in physical activity. Palliative factors included stretching, movement, and spinal manipulative therapy. The patient reported performing no exercise. He described a history of spinal manipulative therapy that provided relief of episodic neck and back pain; however, leg paresthesia had not responded to conservative management.

Evaluation and Treatment: His blood pressure was 137/84 mm Hg, heart rate 72bpm, weight 95.71 Kg, and BMI 27.84. He manages his diabetes and elevated cholesterol levels with medication and reported his most recent hemoglobin A1c level was greater than 9%. Skin inspection showed a surgical scar midline at the levels of L3-L5.

Orthopedic testing revealed equivocal findings of axial back pain. Nerve tension was confirmed with a straight-leg raise test reproducing the patient's dorsolateral foot paresthesia. Lumbar range of motion (ROM) was moderately reduced in flexion and extension, with mild reduction of left and right side-glide. Sensory testing revealed hypoesthesia of the S1 and L5 dermatomes on the anterior/lateral foot, lateral calf, and plantar surface of the foot. Deep tendon reflexes revealed diminished S1

Achilles reflex on the left (1+/2). Motor testing revealed 4/5 left-sided dorsiflexion. Repeated prone lumbar extensions reduced back pain symptoms in addition to the intensity of lateral calf and plantar foot paresthesia; however, dorsolateral leg paresthesia remained constant and unchanged. A provisional diagnosis of lumbar discogenic pain was rendered.

Initial treatment targeted the limited and painful ROM of the lumbar spine through graded exposure end-range loading exercise into lumbar extension (10 repetitions every 2 hours) and high-velocity low amplitude (HVLA) spinal manipulative therapy (supine diversified, side-posture) of the cervical, thoracic, and lumbar spine. Repetition of extension end range loading improved diminished lumbar ROM, diminished back pain, as well as lessened leg paresthesia. After 5 visits, paresthesia in the lateral leg and plantar foot transitioned from constant to intermittent and directly improved with performance of lumbar extension. On visit 6, neurodynamic mobilization exercises (left sciatic/tibial/fibular nerves) were added and performed ipsilaterally (3 x10) and continued for 4 visits due to decreasing posterior leg tightness and decreasing dorsolateral foot paresthesia. On visit 9, following ipsilateral neurodynamic mobilization, contralateral neurodynamic mobilization exercises (right sciatic/tibial/fibular nerves) were performed (3x 10) and diminished ipsilateral leg paresthesia. Neurodynamic mobilization exercises were recommended for home use 3x10 daily, initially ipsilaterally, and then bilaterally. After 12 visits, he observed full reduction of leg paresthesia for 3 weeks, followed by an aggravation that resulted in increased low back pain and leg paresthesia. He was managed with the same interventional strategies for 2 additional visits, and symptoms resolved. He demonstrated good compliance with home exercises concordant with when introduced clinically and was confident to continue self-management. He was treated conservatively twice weekly for 3 weeks and once weekly for 9 weeks for a total of 15 visits over a period of 22 weeks. A 9.5 month follow up with the patient revealed significant reduction in leg paresthesia. He stated that regular performance of home exercises would reduce symptoms and nonadherence would result in symptoms increasing. He provided consent for this case report to be published.

DISCUSSION

This paper reports the multimodal management of a patient with a 20-year history of leg paresthesia following lumbar microdiscectomy.

Two separate diagnoses were suspected in this case, an S1 radiculopathy and L5 discogenic pain. L5 discogenic pain was supported by corresponding back pain, intermittent paresthesia in the L5 dermatome, and dorsiflexion motor weakness. More convincing was the production of a centralization phenomenon with repeated movements of the spine. (4,24) S1 radiculopathy was supported by a diminished achilles reflex, S1 dermatome sensory loss, and positive dural tension increasing S1 paresthesia. We believe that ipsilateral and contralateral neurodynamic mobilization exercises provided a combined resultant tensile force that produced adequate load to diminish nerve mechanical sensitivity over time. Comparatively, Melbye published a case report of a suspected adhesive radiculopathy treated with progressive longitudinal stress of neural structures. (25)

Ross 1996 identified a clear association between the presence of peridural scarring as an increased risk factor for persistent radicular symptoms post-operatively. (26) Risk factors leading to peridural scaring are not well established, yet epidural fibrosis has been reported to be causative in up to 46% of failed back surgery syndrome cases. (13)

Exercise therapy consisting of repetitive movements has been well documented in the literature as an effective strategy for management of discogenic back pain. (4,27-30) This method of intervention is reliable (31,32) and prescribes repeated or sustained end range joint movements based primarily on symptomatic and mechanical responses to prescribed movements. A characteristic of repeated end range loading is the phenomenon of centralization, defined as the proximal migration of distal symptoms originating from the spine in response to specific end-range loading procedures. (24,33) Centralization has been demonstrated to offer a good prognosis. (24)

Neurodynamic mobilization is an intervention aimed at mobilizing the nervous tissue itself or the structures that surround the nervous tissue, and has been demonstrated to reduce intraneural edema, reduce mechanical hyperalgesia, and influence increased immune responses following nerve injury. (31,32) The effects of neurodynamic mobilization exercises on conditions such as postoperative back or leg symptoms and chronic conditions remains unclear. (16,17)

When performing and holding an ipsilateral slump's test, a normal response to contralateral knee extension is a decreased evoked sensation (posterior thigh stretch

sensation) on the ipsilateral side. (20-23) The underlying mechanism for this response is not fully understood but suggests the bilateral tautness of the nerve roots draw the cord caudally and therefore reduce tension in the roots on the other side, assisting each other in distribution of tension. (23) Several studies have examined the anatomical basis of this mechanism and found bilateral dural tension procedures result in nearly doubled the cord excursion when compared with unilateral movements alone. (20-22) The mechanism supporting reduction of pain with sciatica is not well understood.

It is apparent that an underlying neuroanatomical model exists when performing neural tensioning procedures ipsilaterally, contralaterally, and in unison, however this neural crossover mechanism has not been documented in the literature as being therapeutically useful. (23) This case provides support for using contralateral neurodynamic mobilization exercises, when used in conjunction with end range loading, and ipsilateral neurodynamic mobilization exercises to potentially offer a therapeutic benefit for those suffering postoperative leg paresthesia.

This case report outlines a unique management strategy for post-operative leg paresthesia. However, due to a limited understanding of the exact mechanism for pain generation with neurodynamic mobilization tests/exercises, and the multimodal interventions utilized in managing this patient, the proposed mechanism of decreasing mechanical sensitivity through progressive tensile force would be supported by neuroanatomical studies but is strictly conjecture if directly responsible for the improving paresthesia.

Limitations: This case report contains several limitations. First, there was a lack of consistent objective patient-reported outcome measures performed. Second, inferring a causal relationship between treatment interventions and suspected diagnosis cannot be established by this type of report. Lastly, the mechanism for symptom improvement is not clear and requires further study.

CONCLUSION

This report presents a case in which adhesive radiculopathy was suspected. The patient with chronic postoperative leg paresthesia reported a decrease in symptomatology with the application of manual therapy and exercise, with final abolition of symptoms after 15 treatments. The results suggest manual therapy and exercise may offer relief of persistent symptoms in individuals with a prior history of lumbar microdiscectomy.

The clinical relevance is that this case describes 1 approach to management of persistent post-operative leg paresthesia. Ipsilateral and contralateral neurodynamic mobilization exercises may offer therapeutic support for lower extremity leg paresthesia.

Acknowledgement: We would like to acknowledge Brian Anderson DC, PhD for his expertise and mentorship in the development of this paper.

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