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EXTENSION END-RANGE LOADING FOR LUMBAR SPINAL STENOSIS: A CASE REPORT

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ABSTRACT

Objective: To discuss the multimodal management of a patient with low back pain and spinal stenosis.

Clinical Features: A 73-year-old female sought chiropractic care for chronic low back pain with unilateral radicular leg pain. Aggravating factors included walking and standing. Alleviating factors included rest, medication, and spinal manipulative therapy. Her previous MRI report indicated marked central canal and mild neuroforaminal stenosis at L4-L5 due to a Grade 1 spondylolisthesis, disc bulging, facet arthropathy, and degenerative disc disease.

Intervention and Outcome: Treatment consisted of high-velocity low-amplitude chiropractic spinal manipulative therapy and repetitive lumbar extension end-range loading exercises for eight visits over eight weeks. A home exercise program of end range loading and walking was prescribed and reinforced. The patient reported resolution of the radicular leg pain and improvement in low back pain. Upon discharge, the Back Bournemouth Questionnaire improved from 33/70 to 11/70 and maintained a 11/70 at a 7-month follow up.

Conclusion: This report presents a patient with unilateral radicular leg pain and spinal stenosis that responded positively to spinal manipulative therapy and lumbar extension end range loading exercises. The results suggest extension exercises may offer some value for those with image-supported spinal stenosis. *(J Contemporarty Chiropr 2023;6:56-61)*

Key Indexing Terms: Chiropractic; Lumbar Spinal Stenosis; Low Back Pain

INTRODUCTION

Symptomatic lumbar spinal stenosis(LSS) is a costly condition that frequently leads to pain and disability in older adults, yet current practice patterns are challenged in identifying best practices (most appropriate management). (1) Spinal stenosis is the most common cause of radicular leg pain in individuals of 60 years or greater as well as the most common reason for spinal surgery in patients over 65 years of age. (2,3) Symptomatic LSS affects more than 200,000 adults in the United States and approximately 103 million individuals globally. (1) Clinically, spinal stenosis is associated with reduced space available for neural and vascular components and manifests as pain in the back, buttocks, or legs. Spinal stenosis usually results in a process of progressing spinal degeneration; however, this does not always correlate to worsening symptoms. (3-5) Functional impairments include limitations with prolonged walking or standing and place individuals at increased risks of falling. (6-8) Lumbar spinal extension typically aggravates symptoms, while lumbar flexion, sitting, and recumbency help to alleviate associated symptoms. (3)

The natural history and prognosis of lumbar spinal stenosis is based on studies that have followed patients who have not undergone surgical intervention. One study of 146 patients followed patients over 3 years and reported 30% of participants improved, 50% reported

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no change, and 10-20% reported worsening. Abrupt worsening is uncommon, and observations suggest, that in the absence of cauda equina syndrome treatment decisions should be guided by pain and interference with daily activities other than concern for rapid neurological deterioration. (1)

Clinical care pertaining to lumbar spinal stenosis is challenging for the treating clinician for several reasons. There is lack of standard diagnostic criteria as well as high rates of anatomic stenosis as seen on imaging in which patients are completely asymptomatic. (3) Non-surgical options for treatment include pharmaceuticals, physiotherapy, epidural injections, lifestyle modifications and multidisciplinary rehabilitation. The North American Spine Society's (NASS) clinical guidelines recommended epidural steroid injections and surgical decompression as evidenced-based interventions (9); however, more recent evidence challenges these recommendations.(1) The guideline further concluded that there is insufficient evidence to make a recommendation for or against the use of non-surgical interventions including pharmacological treatment, physical therapy, exercise, and spinal manipulation.(9)

Since 2019, researchers have attempted to bridge the evidence-based gap between non-surgical treatment options for lumbar spinal stenosis through several systematic reviews. (10-15)This case report describes a favorable therapeutic outcome using manual therapy and guided therapeutic exercise for a patient with radicular low back pain and spinal stenosis.

CASE REPORT

History: A 73-year-old female sought chiropractic intervention for chronic low back pain (LBP) and unilateral leg pain. She reported symptoms stemming back to a motor vehicle accident (MVA) in 2009 (12 years prior) that have remained consistent and refractory to management. An MRI obtained following the MVA indicated marked central canal and mild neuro-foraminal stenosis at L4-L5 due to a Grade 1 spondylolisthesis, disc bulging, facet arthropathy, and degenerative disc disease. She was informed that the persistent nature of her symptoms were due to spinal stenosis.

Current Presentation: She reported LBP symptoms as 5/10 with rest, and 9/10 with physical activity on a Visual Analog Scale (VAS). She had a history of pain referral into her legs bilaterally; however, her current presentation indicated left-sided leg pain only. Frequency of symptoms were intermittent, daily, and worsening as the day progressed. Symptoms were described as stabbing and heavy. Aggravating factors included walking, standing, and general activity. Alleviating factors included rest, medication (NSAIDS), and spinal manipulative therapy (short-term). Activities of daily living and recreation were largely diminished due to back/leg symptoms. The patient reported an ability to walk for 2 minutes before fatigue, pain, and shortness of breath would limit further engagement. She lived on the third floor of an apartment complex and was unable to ascend 3 levels consecutively due to deconditioning.

Evaluation and Treatment: Examination revealed vitals of 138/81 mm Hg, 61bpm, weight 307 lbs., and a BMI of 71.35. She managed significant lower extremity edema, musculoskeletal pain, hypertension, and hypothyroidism with medication. Constitutionally, she displayed significant deconditioning and shortness of breath upon evaluation.

Orthopedic testing (Kemp's Test) revealed left-sided axial back pain and gluteal pain. Nerve tension was confirmed with a Slump's Test that reproduced the patient's concordant pain from the low back to the knee. Thoracolumbar range of motion was moderately reduced in extension, with pain referral into the left leg, mild reduction in flexion, and no loss of bilateral side glides. Sensory testing revealed hyperesthesia in the lower legs bilaterally; however these findings appeared to be related to increased sensitivity due to significant lower extremity edema. Deep tendon reflexes were unremarkable. Motor testing revealed losses (4/5) in bilateral hip flexion, knee extension, knee flexion with normal findings of foot plantar and dorsiflexion. A centralization phenomenon was demonstrated with repeated prone lumbar extensions (3 sets x 10 repetitions). With performance of each successive set, leg pain symptoms ascended the leg and localized to the lumbar spine. Upon completion of 30 repetitions into lumbar extension, leg symptoms had abolished, and Slump's test retested as negative. A local biomechanical evaluation revealed segmental and somatic dysfunction of the thoracic and lumbar regions. A provisional diagnosis of lumbar discogenic pain was rendered, with significant deconditioning and concomitant lumbar spinal stenosis.

Initial treatment consisted of prone end-range loading exercises into lumbar extension and high-velocity low-amplitude (HVLA) spinal manipulative therapy (SMT) of the thoracic and lumbar spine. She returned on visit 2 with significant reduction in low back pain and

leg symptoms with performance of lumbar extension. However, this movement initiated a provocation of a prior shoulder injury with performance of prone extensions. The patient was transitioned to performing extension in standing while facing the wall as well as extension in standing backwards over a fulcrum (elevated desk, elevated therapy table, etc.). These 2 modifications continued to provide therapeutic benefit without further provocation of shoulder pain. We recommended a high frequency of exercise performance (10 reps every 2 hours), which she engaged with good compliance. Over the subsequent 6 visits, in addition to lumbar extension exercises and SMT, a walking regimen was added and reinforced to address deconditioning. She was treated once weekly for a period of 8 weeks, after which she continued self-management of home exercises and a walking regimen. She was then able to fully ascend 3 flights of stairs without stopping and was regularly walking in intervals of 5-7 minutes. The patients Back Bournemouth Questionnaire findings improved from 33/70 to 11/70 after 8 treatment sessions. Long-term follow up with the patient (7 months) revealed continued therapeutic benefit with standing in extension exercises and a maintained Back Bournemouth finding of 11/70. The patient provided consent for this case report to be published.

DISCUSSION

This case discusses the conservative management of a patient with low back pain and spinal stenosis. There were several complicating factors identified with this patient, including lumbar spine discogenic pain, central canal stenosis with corresponding age-related changes, and overt deconditioning. Lumbar discogenic pain was supported by a centralization phenomenon with repeated end range extension movements of the spine. (16,17) This assessment is reliable and has been demonstrated to offer a good prognosis as an effective strategy for managing discogenic low back pain. (16-26) Centralization can be defined as the proximal migration of distal symptoms originating from the spine in response to specific end-range loading movements. (16) Marked central canal and neuro-foraminal stenosis, Grade 1 spondylolisthesis and associated degenerative changes were identified through lumbar MRI. Overt deconditioning was supported by walking stamina of 2 minutes duration and an inability to ascend 2 flights of stairs before shortness of breath limited further engagement.

We believe the patients' radicular leg pain symptoms were related to lumbar discogenic pain due to a centralization phenomenon as supported through diagnostic utility studies (27) and the stenotic changes may have been asymptomatic. We believe the observed changes are in response to increased self-efficacy, decreased passive coping, and improved stamina.

The 2011 North American Spine Society (NASS) Guidelines state there is insufficient evidence to recommend physical therapy for lumbar spinal stenosis (9); however, in 2020 the World Federation of Neurosurgical Societies (WFNS) Spine Committee offered a strong positive consensus (regarding LSS) in the event of "non-severe clinical conditions, a conservative approach based on at least three weeks of therapeutic exercise may be the first therapeutic choice." (24)

A recent systematic review by Katz *et al* (2022) acknowledged benefits from structured, supervised exercise programs with concurrent manual therapy for improving long-term walking ability, pain, and function in persons with lumbar spinal stenosis.(1,25,26)

A randomized clinical trial comparing the effectiveness of nonsurgical treatment found manual therapy with individualized exercise to offer better short-term outcomes compared to group exercise classes and standard medical care, with demonstrated improvements in long-term walking capacity. (25)

Lumbar spinal stenosis (LSS) is often provoked by standing, walking or lumbar spinal extension and relieved by forward flexion and sitting. (3) Conservative care interventions for LSS are often multimodal and may involve the following: patient education, lumbar distraction mobilization, flexion distraction, spinal, hip, or sacroiliac manipulation, muscle strengthening and stretching, motor control exercises, aquatic therapy, passive modalities and an emphasis on flexion-biased movements (cycling, rowing, etc.). These care interventions are commonly provided in conjunction with a graded walking regimen. (1) Compromised walking ability is reported as the most common reason for care seeking for LSS and is associated with increased levels of depression, hopelessness, and anxiety, and is a significant functional impairment that can lead to sedentary lifestyle and overall health decline. (26)

Clinical care pertaining to stenosis presents challenges that include a lack of gold standard criteria for diagnosis, a limited understanding of causal mechanisms, and the potential for simultaneous musculoskeletal and psychosocial comorbidities. (17) Spinal stenosis is largely diagnosed exclusively through

imaging, which creates ambiguity as approximately 20% of people older than 60 years have image-supported evidence of LSS, yet more than 80% are asymptomatic. (1) Further, LSS does not correlate to a strict downward trajectory that only worsens with time. Findings over a 3-year period have demonstrated 30% of LSS cases improved and 50% did not change. (5)

The involved case provides a unique report of a patient with image-supported central and neuro-foraminal stenosis that received a therapeutic response with extension-based interventions. We were unable to find further evidence of extension-based activity offering therapeutic support for LSS other than what may be acquired with a walking regimen. This finding raises questions of the progenitor of symptoms in this case. It is likely that people with spinal stenosis may have low back pain due to any structure or physiologic process of the lumbar region (nociceptive, discogenic, myofascial, sacroiliac, facet, or neuropathic pain) that could co-occur with symptomatic or asymptomatic LSS. In this case, clinical examination findings took precedent over imaging findings and some historical clues that indicated stenosis as the culprit and a positive therapeutic outcome was achieved.

Limitations

This case report contains several limitations. First, inferring a causal relationship between treatment interventions and suspected diagnosis cannot be established by this type of report. Second, the MRI was performed 12 years prior to establishing care with the patient. Over this time, advancement of the degenerative and stenotic changes of the low back may occur: however, this was not confirmed through more recent imaging so the current structural makeup cannot be commented on. Lastly, there was a lack of consistent objective patient-reported outcome measures outlining some psychosocial influences that were present, addressed in our care, and reinforced in our care delivery that would have been beneficial to document due to the multifactorial nature of persistent pain.

CONCLUSION

This report presents a patient with unilateral radicular leg pain and spinal stenosis that responded positively to SMT, lumbar extension end-range loading exercises, and a walking regimen. The results suggest an example of image supported spinal stenosis that may have been asymptomatic or a case where spinal stenosis had a favorable response to extension-based activity and walking. The results and responses of this case support the importance of a clinical examination and not sole reliance on image-generated diagnoses or clinical history to dictate low back pain management.

Patient consent

Patient written consent obtained and retained by the author.

REFERENCES

1. Katz JN, Zimmerman ZE, Mass H, Makhni MC. Diagnosis and management of lumbar spinal stenosis: a review. JAMA 2022;327(17):1688-1699. doi:10.1001/jama.2022.5921

2. Knezevic NN, Candido KD, Vlaeyen JWS, Van Zundert J, Cohen SP. Low back pain. Lancet 2021;398(10294):78-92. doi:10.1016/S0140-6736(21)00733-9

3. Lurie J, Tomkins-Lane C. Management of lumbar spinal stenosis. Br Med J 2016;352:h6234. doi:10.1136/bmj.h6234

4. Orita S, Inage K, Eguchi Y, *et al*. Lumbar foraminal stenosis, the hidden stenosis including at L5/S1. Eur J Orthop Surg Traumatol 2016;26(7):685-693. doi:10.1007/s00590-016-1806-7

5. Wessberg P, Frennered K. Central lumbar spinal stenosis: natural history of non-surgical patients. Eur Spine J 2017;26(10):2536-2542. doi:10.1007/s00586-017-5075-x

6. Winter CC, Brandes M, Müller C, *et al*. Walking ability during daily life in patients with osteoarthritis of the knee or the hip and lumbar spinal stenosis: a cross sectional study. BMC Musculoskeletal Disorders 2010;11(1):233. doi:10.1186/1471-2474-11-233

7. Muraki S, Akune T, Oka H, *et al*. Prevalence of falls and the association with knee osteoarthritis and lumbar spondylosis as well as knee and lower back pain in Japanese men and women. Arthritis Care Res 2011;63(10):1425-1431. doi:10.1002/acr.20562

8. Kim HJ, Chun HJ, Han CD, *et al*. The risk assessment of a fall in patients with lumbar spinal stenosis. Spine 2011;36(9):E588-592. doi:10.1097/BRS.0b013e3181f92d8e

9. Kreiner DS, Shaffer WO, Baisden J *et al*. An evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis (update).Spine j 2013;13(7):734-743. doi: 10.1016/jspinee.2012.11.059

10. Ammendolia C, Stuber K, de Bruin LK *et al*. Nonoperative treatment of lumbar spinal stenosis with neurogenic claudication: a systematic review. Spine 2012;37(10):E609-616. doi:10.1097/BRS.0b013e318240d57d

11. Ammendolia C, Stuber K, Tomkins-Lane C, *et al*. What interventions improve walking ability in neurogenic claudication with lmbar spinal stenosis? A systematic review. Eur Spine J 2014;23(6):1282-1301. doi:10.1007/s00586-014-3262-6

12. McGregor AH, Probyn K, Cro S, *et al*. Rehabilitation following surgery for lumbar spinal stenosis. A Cochrane review. Spine 2014;39(13):1044-1054. doi:10.1097/BRS.0000000000000355

13. Fritsch CG, Ferreira ML, Maher CG *et al*. The clinical course of pain and disability following surgery for spinal stenosis: a systematic review and meta-analysis of cohort studies. Eur Spine J 2017;26(2):324-335. doi:10.1007/s00586-016-4668-0

14. L M, Nn K, Mv B, Ad K, Ja H. Epidural injections for lumbar radiculopathy and spinal stenosis: a comparative systematic review and meta-analysis. Pain Physician 2016;19(3). Accessed October 25, 2022. https://pubmed.ncbi.nlm.nih.gov/27008296/

15. Zaina F, Tomkins-Lane C, Carragee E, Negrini S. Surgical versus nonsurgical treatment for lumbar spinal stenosis. Spine 2016;41(14):E857-E868. doi:10.1097/BRS.0000000000001635

16. Surkitt LD, Ford JJ, Hahne AJ, Pizzari T, McMeeken JM. Efficacy of directional preference management for low back pain: a systematic review. Phys Therap 2012;92(5):652-665. doi:10.2522/ptj.20100251

17. Vining RD, Minkalis AL, Shannon ZK, Twist EJ. Development of an evidence-based practical diagnostic checklist and corresponding clinical exam for low back pain. J Manipulative Physiol Ther 2019;42(9):665-676. doi:10.1016/j.jmpt.2019.08.003

18. Garcia AN, Costa L da CM, de Souza FS *et al*. Reliability of the mechanical diagnosis and therapy system in patients with spinal pain: a systematic review. J Orthop Sports Phys Ther 2018;48(12):923-933. doi:10.2519/jospt.2018.7876

19. Takasaki H, Okuyama K, Rosedale R. Inter-examiner classification reliability of mechanical diagnosis and therapy for extremity problems – systematic review. Musculoskeletal Science Practice 2017;27:78-84. doi:10.1016/j.msksp.2016.12.016

20. Albert HB, Manniche C. The efficacy of systematic active conservative treatment for patients with severe sciatica: a single-blind, randomized, clinical, controlled trial. Spine 2012;37(7):531-542. doi:10.1097/BrS.0b013e31821ace7f

21. Fritz JM, Lane E, McFadden M *et al*. Physical therapy referral from primary care for acute back pain with sciatica. Ann Intern Med 2021;174(1):8-17. doi:10.7326/M20-4187

22. Long A, Donelson R, Fung T. Does it matter which exercise?: a randomized control trial of exercise for low back pain. Spine 2004;29(23):2593-2602. doi:10.1097/01.brs.0000146464.23007.2a

23. Petersen T, Larsen K, Nordsteen J, Olsen S, Fournier G, Jacobsen S. The McKenzie Method compared with manipulation when used adjunctive to information and advice in low back pain patients presenting with centralization or peripheralization: a randomized controlled trial. Spine 2011;36(24):1999-2010. doi:10.1097/BRS.0b013e318201ee8e

24. Fornari M, Robertson SC, Pereira P *et al*. Conservative treatment and percutaneous pain relief techniques in patients with lumbar spinal stenosis: WFNS Spine Committee Recommendations. World Neurosurg X 2020;7:100079. doi:10.1016/j.wnsx.2020.100079

25. Schneider MJ, Ammendolia C, Murphy DR *et al*. Comparative clinical effectiveness of nonsurgical treatment methods in patients with lumbar spinal stenosis. JAMA Netw Open 2019;2(1):e186828. doi:10.1001/jamanetworkopen.2018.6828

26. Ammendolia C, Côté P, Southerst D *et al*. Comprehensive nonsurgical treatment versus self-directed care to improve walking ability in lumbar spinal stenosis: a randomized trial. Archives Phys Med Rehabil 2018;99(12):2408-2419. e2. doi:10.1016/j.apmr.2018.05.014

27. Petersen T, Laslett M, Juhl C. Clinical classification in low back pain: best-evidence diagnostic rules based on systematic reviews. BMC Musculoskelet Disord 2017;18:188. doi:10.1186/s12891-017-1549-6