

# Effectiveness of Spinal Mobilization with Leg Movement Versus McKenzie Back Extension Exercises in Lumbar Radiculopathy

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## ABSTRACT

**Background:** Lumbar Radiculopathy is characterized as radiating pain along with some sensory and motor deficits in lower back and hip into the leg. Manual therapy techniques like Spinal mobilization with leg movement and McKenzie Extension exercise seems to be effective in treating and managing the symptoms associated with Radiculopathy.

**Aim:** To make comparison between effects of Spinal mobilization with leg Movement versus McKenzie Extension exercise to manage the Lumbar Radiculopathy.

**Methods:** The present Randomized Control Trial included 60 patients of age 28-50 years with Lumbar radiculopathy were grouped into two by sealed envelope method; the first group (A) was Experimental Group, while the other group (B) was the control Group and were selected from City hospital Multan from February 2018 to June 2018. The study participants were requested to complete the protocol for 4 weeks (3 days per week, 30 repetitions in one session). All the subjects were examined before and after the tests, for pain intensity (NPRS), functional Mobility measured by MODI and range of motion by goniometry.

**Results:** Results of the study showed significant decrease in pain intensity on NPRS ( $P < 0.05$ ) and MODI Scoring ( $P < 0.05$ ) with noticeable improvement in Functions and range of motion measured by Goniometry. (Readings were taken at 1<sup>st</sup> session and at the end of the completion of the session). Pain was equally reduced in both groups while improvement in MODI scoring and Range of motion was more significant in experimental group (A) with respect to the control group (B).

**Conclusion:** Study showed that both techniques SMWLW and McKenzie Extension Exercises were effective in improving the pain, decreasing the severity and MODI Scoring while SMWLM is more effective in improving range of motion.

**Keywords:** Lumbar Radiculopathy, Spinal mobilization with leg movement, McKenzie Extension Exercises

## INTRODUCTION

Radiculopathy defined as the sum total composite of symptoms which occur from Nerve root involvement characterized by sensory and motor deficits. Radiculopathy is differing from nerve root pathology or radicular pain". Radiculopathy and radicular pain may found jointly, however radiculopathy may arise without pain and radicular pain can found without radiculopathy. Radicular pain or nerve root pain associated with the single symptoms i.e. pain which is caused by one or more spinal nerve roots involvement. Lumbar radiculopathy accompanied by multiple symptoms involving the spinal nerve roots from L1 to S1<sup>1,2</sup>.

When compared with low backache, prevalence of lumbar radiculopathy is 4 to 6 percent among the common population. 6-11% of patients with low back pain also complain sciatica symptoms. Disc related sciatica in general population is probably at a rate of 4.4%.<sup>3</sup>

Lumbar radiculopathy is a pathology that usually arises as a result of considerable socioeconomically causes. The frequency of lumbar radiculopathy due to disc pathology is 3%. Working population is more susceptible in

developing low back pain with 11.10% occurrence while 13% owing to lumbar radiculopathy. The incidence of lumbosacral radiculopathy has been sited from 10% to 26%, however in most of the cases pain and interrelated symptoms resolves after two weeks approximately while at the same time a considerable group (35%) remains with pain for a year or more than a year<sup>4</sup>.

The main cause of lumbar Radiculopathy is impingement of peripheral nerves that comes out from the intervertebral foramina due degenerative changes(osteophyte formation) or by the disc prolapsed resulting in pain with or without sever neurological symptoms(e.g. numbness, paresthesia, reflex abnormality and motor weakness).<sup>3, 5</sup>In patients with the age lower than fifty year, a prolapsed disc is the most usual cause while after the age fifty; radiculopathy is mainly caused by osteoarthritic changes related to age in the spine (stenosis of the foramen intervertebral)<sup>6,7</sup>.

Predisposing factors for radiculopathy are activities that put an undue and extreme repetitive load on the spine. Population occupied in heavy work or contact sports are at high risk to develop radiculopathy as compared to those with a more sedentary lifestyle<sup>8</sup>.

Secondary Risk factors for acute lumbar radiculopathy are (peak 40-60 years) smoking, mental strain, lengthy physical activity (regular lifting) and driving (shaking of whole body)<sup>9</sup>.

Lumbar radiculopathy may treat in a conventionally or a surgical means. The internationally accepted protocol says that conventional management is prescribed for the first 6-8 weeks while surgical procedures should be presented only if complaints stay longer for more than six weeks after a conventional management<sup>16</sup>.

The conventional management is primarily designed for pain control and includes the use of pharmacological management by pain killers like NSAIDs, muscle relaxants and steroids while several other conventional treatments regimes including the physiotherapy exercises and manual therapy techniques. Most of the patient's response to conventional treatment<sup>7</sup> if patients don't response to conventional treatment, then clinician recommended the surgery. surgical procedures depends upon the patient condition and disease pathology<sup>13</sup>.

Physical therapy can have an advantageous effect and frequently a first line treatment. Both exercise therapy and manual therapy are effective. Physical therapy treatment protocol may comprise of mild stretching and pain relief modalities, conditioning exercise, ergonomic program, mobilization and manipulation mainly focus on improvement in flexibility and strengthening of neuromuscular and musculoskeletal system<sup>17</sup>.

The two manual therapy techniques McKenzie Extension Exercises and Spinal Mobilization with leg movement are briefly discussed as these two different regimes were compared in the study to treat the lumbar radiculopathy. McKenzie extension exercises mainly use for managing pain in the patients suffering from low back pain cause by any musculoskeletal or neuromuscular derangements<sup>18</sup>. Basically three main principles of McKenzie used clinically to treat the symptoms which depends upon the pathology that whether it is flexion biased or extension biased. Flexion Biased treat with extension principle while extension biased treat with flexion principle<sup>19</sup>.

McKenzie extension exercises were used for Lumbar radiculopathy and correction of kyphotic Antalgic posture. To perform these exercises, we ask the subject to lie on the stomach, then putting the weight on elbow and further progressed the weight bearing on hands<sup>20</sup>.

The other manual therapy technique developed by Brian Mulligan to treat the spinal pathology arising by mechanical restriction causing the Lumbar radiculopathy, SMWLM technique performed in side lying, with the affected leg upmost; patient lies facing towards the therapist with an assistant therapist supporting the patient's affected leg. Therapist flexes over patient and placed one thumb reinforced over other on the spinous process of the chosen vertebra as palpated with orientation to posterior superior iliac spine. The therapist then applies the pressure on chosen spinous process. The pressure is maintained and the patient actively performs the offending movement for the leg supported by the assistant provided<sup>21</sup>. The objective of the current study was to compare the effects of Spinal mobilization with leg Movement with McKenzie Extension exercise to manage the Lumbar Radiculopathy.

## METHODOLGY

This study was done as RCT (Randomized Control Trial) the department of in physical therapy, City Hospital Multan to evaluate the effectiveness of Spinal Mobilization with leg movement versus McKenzie Extension exercises from February 2018 to July 2018. A sample of 66 patients was calculated and was divided into two groups, each having 33 patients. Initially a screening was carried out as per inclusion criteria i.e. Age b/w 28-50 years, clinically diagnosed patient with Lumbar radiculopathy and both male and females were included in the study while exclusion criteria included, Fracture, Trauma Inflammatory disorder Acute disc bulge, Lumbar instability, scoliosis, Patient with RA and other systemic diseases. After selecting patients according to inclusion and exclusion criteria, they were divided into two groups, A and B by sealed envelope method. Both groups received routine physiotherapy interventions along with specific interventions. Treatment protocol for group A was conventional Treatment (Application of Hot pack for 10min) along with Specific Treatment-Spinal Mobilization with Leg Movement and for group B was Conventional Treatment (Application of Hot pack for 10min.) accompanied by Specific Treatment- McKenzie Extension Exercises.

Interventional group (Group A) treated with SMWLM performed in side lying, patient facing the physiotherapist while the leg movement may assist by another person (Physiotherapist/assistant). Sustained transverse glide is given on the desired spinous process with 10 repetition of offending movement in first session while 10 reps in each of 3 sets in further sessions. Whole treatment was given for four weeks and three sessions per week.

Control group (Group B) were treated by McKenzie Extension Exercises performed actively in prone position. Extension exercises performed in three stages, initially patient instructed to be just lift the neck and look on front at the eye level, then progressed next and weight bearing on the elbow by lifting up the shoulder and then moved on 3<sup>rd</sup> and final steps in which complete trunk extension is performed and weight bearing is on the hands, time frame was the same as for group A, the 10 reps in 1<sup>st</sup> session then 10 reps in each of 3 sets in further sessions for four weeks and three sessions per week.

## RESULTS

Both groups included male and female participants. Participants mean age for the experimental group was 41.43±6.426 while the mean age of Control group was 40.83±6.36. Most affected population in both experimental and control group was House wives with 66% frequency as displayed in table 1 which showed the demographics of study participants.

Normality of data distribution was evaluated by applying Q-Q plots and Shapiro-Wilk tests which showed that data is not normally distributed. Non parametric tests, like Wilcoxon Signed Rank Test, for comparison within the groups, and Mann Whitney Test, for comparison between the two (A & B) Groups, were applied to measure the pre and post Values of lumbare ranges, MODI and NPRS. The difference of pre and post treatment results is showed in tables.

As the data was not normally distributed for NPRS, MODI and Lumbar ranges and normality test showed non-significant results at baseline so Mann Whitney Test was utilized for comparison between experimental and control group. Comparison between groups revealed that patients in Interventional group treated with SMWLM showed more improved in functional lumbar ranges as compared to control group while reduction in pain and improvement in MODI scoring was similar in both groups as shown in Table 2. A significant improvement was depicted by Wilcoxon test for comparison within Group A in lumbar ranges, NPRS and MODI post test score with p value < (0.05)(0.00) and Wilcoxon test for comparison within control group showed

significant improvement in Lumbar ranges, NPRS and MODI post test score with p value<(0.05)(0.00)

Table 1: Demographic (showing age with mean and standard deviation with Gender and profession of study participants)

Variable	Group A	Group B
Age	Mean±SD	Mean±SD
	Frequency%	Frequency%
<b>Gender</b>		
Male	6	8
Female	24	22
<b>Profession</b>		
Worker	10(33%)	10(33%)
House wife	20(66%)	20(66%)

Table 2: Mann Whitney Test applied between the Groups (Group A and B)

Variables	Group	IQ(IQ1-1Q3)	Median	Mann Whitney Value	Z-Value	P-Value
NPRS	Pre	Experimental	2 (6)	353	-1.495	.135
		Control	1 (6)			
	Post	Experimental	2 (3)	430	-.304	.761
		Control	2 (3)			
MODI	Pre	Experimental	22 (49)	424	-.378	.705
		Control	19 (52)			
	Post	Experimental	15 (21)	332	-1.755	.079
		Control	18 (27)			
Lumbar Flexion	Pre	Experimental	8 (44)	333	-1.738	.082
		Control	10 (45)			
	Post	Experimental	3 (55)	253	-2.940	.003
		Control	10 (50)			
Lumbar Extension	Pre	Experimental	2 (14)	423	-.400	.690
		Control	3 (14)			
	Post	Experimental	2 (22)	112	-5.050	.001
		Control	3 (18)			
Lumbar Rt. Side Bending	Pre	Experimental	2 (14)	427	-.338	.735
		Control	3 (14)			
	Post	Experimental	4 (23)	92	-5.323	.001
		Control	4 (18)			
Lumbar Lt. Side Bending	Pre	Experimental	3 (14)	338	-1.671	.095
		Control	3 (13)			
	Post	Experimental	3 (22)	25	-6.315	.001
		Control	2 (16)			
Lumbar Rt. Rotation	Pre	Experimental	3 (10)	449	-.008	.994
		Control	3 (10)			
	Post	Experimental	2 (15)	139	-4.175	.001
		Control	3 (13)			
Lumbar Lt. Rotation	Pre	Experimental	2 (10)	367	-1.238	.216
		Control	3 (10)			
	Post	Experimental	2 (15)	135	-4.715	.001
		Control	2 (13)			

**DISCUSSION**

In present study, although the statistical results were insignificant as p value was > 0.05(.761) of post NPRS and p value of post MODI was > 0.05(.079) which means that both group showed improvements in pain intensity and functional scoring. So clinically both techniques are effective in controlling pain and improving functional scoring. The statistical results of lumbar functional ranges (Flexion, extension, side bending and rotation) were significant as p value was <0.05, which means that experimental group showed the improvements which was treated by SMWLM. It means SMWLM is more effective in

improving the lumbar region ranges when compared with McKenzie extension exercises.

A similar study was done by Yadav et al., to evaluate the effectiveness of SMWLM in patients suffering from Lumbar radiculopathy due to Disc herniation, which highlighted the same finding of significant decrease in pain with increase in functional mobility in both groups but Range of movement is or improved in experimental group treated with SMWLM. Result of this study supports the results of my study in aspect to reduction in pain intensity and improvement in ROM<sup>24</sup>.

Another RCT was done in 2016 to compare the effects of SMWLM versus neural tissue mobilization in patients suffering from low back pain due to lumbosacral

radiculopathy. For measuring the outcome, tools used were NPRS and MODI. The findings regarding both techniques were inferred as effective in controlling the pain but SMWLM is more effective in improving the functional scoring, which was in favour of my study regarding improving the ROM in patients treated with SMWLM<sup>22,23</sup>

Recent a meta-analysis was done by Pourahmadi et al. to analyse the effectiveness of SMWLM in managing the low back pain. Total 20 studies were included. Results of the study were showing that Mulligan Technique is effective in controlling pain intensity but conclusion of the meta analysis explained that there is insufficient amount of evidence to conclude that Mulligan technique is effective to reduce the pain alone<sup>34</sup>.

In 2014, A randomized control trial (RCT) by Syra et al., was conducted to evaluate the effectiveness of Mulligan SNAGs versus McKenzie EEP. A total of 37 patients were screened out as per inclusion criteria and randomly placed into two groups. Twenty patients in group A were treated with Mulligan SNAGs and 17 patients in group B with McKenzie EEP for four weeks at two sessions per week and single session per day. Visual Analogue Scale (VAS), Oswestry Disability Scale (ODI) and lumbar Range of Motion (ROM) were used as assessment tools and were measured at baseline and at the completion 4 weeks intervention. At the completion of 4 weeks intervention the pre and post statistical analysis revealed that clinically the McKenzie EEP improved pain and disability slightly more than Mulligan SNAGs while the Mulligan SNAGs improved lumbar ROM more effectively than McKenzie EEP in all directions including flexion, extension, side bending and rotation. McKenzie EEP is clinically slightly more effective in the management of pain and disability as compared with Mulligan SNAGs, while Mulligan SNAGs are more effective in the improvement of lumbar ROM, hence the results of the study supported the result of my study regarding improving the Lumbar ROM of the group treated with SMWLM<sup>35</sup>.

Several other studies also done to evaluate the efficacy of McKenzie extension exercises to manage the low back pain due Lumbar radiculopathy, study 1n 2018 by Shurti et al., was done to evaluate the effectiveness of McKenzie extension exercise, the results of the study was in favour of McKenzie Techniques in treating the low back pain<sup>36</sup>.

In 2015, a prospective cohort study appraised the non surgical approach effectiveness to treat Lumbar radiculopathy, Non surgical approach was manual therapy techniques including McKenzie Extension exercises. Results showed the significant improvement in managing the Lumbar radiculopathy<sup>37</sup>.

## CONCLUSION

It is concluded from the present study that Spinal Mobilization with Leg Movement and McKenzie extension exercises are equally effective in patients for pain management and improving function scoring in lumbar radiculopathy. However Spinal Mobilization with Leg Movement is more effective in improving Range Of Motion.

**Conflict of interest: The authors declared no conflict of interest.**

## REFERENCES

1. Bogduk N. On the definitions and physiology of back pain, referred pain, and radicular pain. *Pain*. 2009;147(1-2-3):17-9.
2. Schmid AB, Hailey L, Tampin B. Entrapment neuropathies: challenging common beliefs with novel evidence. *Journal of orthopaedic & sports physical therapy*. 2018;48(2):58-62.
3. Nouri KH, Abdi S. Lumbosacral Radicular Pain. *Fundamentals of Pain Medicine*: Springer; 2018. p. 203-8.
4. Bono CM. Lumbar Disc Herniation and Radiculopathy. *Principles of Orthopedic Practice for Primary Care Providers*: Springer; 2018. p. 37-46.
5. Stynes S, Konstantinou K, Ogollah R, Hay EM, Dunn KM. Clinical diagnostic model for sciatica developed in primary care patients with low back-related leg pain. *PLoS one*. 2018;13(4):e0191852.
6. Goff BJ, Guthmiller KB, Clapp JC, Lassiter WB, Baldrige MJ, Hochheimer SM, et al. LumbarRadiculopathy and Radicular Pain. *The Spine Handbook*. 2018:333.
7. Moore KL, Dalley AF, Agur AM. *Clinically oriented anatomy*: Lippincott Williams & Wilkins; 2013.
8. Stankovic R, Johnell O. Conservative treatment of acute low-back pain. A prospective randomized trial: McKenzie method of treatment versus patient education in "mini back school". *Spine*. 1990;15(2):120-3.
9. Yan S, Wang K, Zhang Y, Guo S, Zhang Y, Tan J. Changes in L4/5 Intervertebral Foramen Bony Morphology with Age. *Scientific reports*. 2018;8(1):7722.
10. Farny J, Drolet P, Girard M. Anatomy of the posterior approach to the lumbar plexus block. *Canadian journal of anaesthesia*. 1994;41(6):480-5.
11. Winnie A, Ramamurthy S, Durrani Z. The inguinal paravascular technic of lumbar plexus anesthesia: the "3-in-1 block". *Anesthesia & Analgesia*. 1973;52(6):989-96.
12. PARAMITA NAYAK P. A STUDY TO FIND OUT THE EFFICACY OF INIT (INTEGRATED NEUROMUSCULAR INHIBITION TECHNIQUE) WITH THERAPEUTIC ULTRASOUND Vs INIT WITH PLACEBO ULTRASOUND IN THE TREATMENT OF ACUTE MYOFASCIAL TRIGGER POINT IN UPPER TRAPEZIUS 2013.
13. Coster S, De Bruijn SF, Tavy DL. Diagnostic value of history, physical examination and needle electromyography in diagnosing lumbosacral radiculopathy. *Journal of neurology*. 2010;257(3):332-7.
14. Kennedy DJ, Noh MY. The role of core stabilization in lumbosacral radiculopathy. *Physical Medicine and Rehabilitation Clinics*. 2011;22(1):91-103.
15. Tarulli AW, Raynor EM. Lumbosacral radiculopathy. *Neurologic clinics*. 2007;25(2):387-405.
16. Murphy DR, Hurwitz EL, Gerrard JK, Clary R. Pain patterns and descriptions in patients with radicular pain: Does the pain necessarily follow a specific dermatome? *Chiropractic & Osteopathy*. 2009;17(1):9.
17. Simons DG, Travell JG, Simons LS. *Travell & Simons' myofascial pain and dysfunction: upper half of body*: Lippincott Williams & Wilkins; 1999.
18. de Carvalho MEIM, de Carvalho RM, Marques AP, de Carvalho Lucio LM, de Oliveira ACA, Neto OP, et al. Low intensity laser and LED therapies associated with lateral decubitus position and flexion exercises of the lower limbs in patients with lumbar disk herniation: clinical randomized trial. *Lasers in medical science*. 2016;31(7):1455-63.
19. Liebenson C. *Rehabilitation of the spine: a practitioner's manual*: Lippincott Williams & Wilkins; 2007.
20. May S, Donelson R. Evidence-informed management of chronic low back pain with the McKenzie method. *The Spine Journal*. 2008;8(1):134-41.
21. Wilson E. The Mulligan concept: NAGS, SNAGS and mobilizations with movement. *Journal of Bodywork and Movement Therapies*. 2001;5(2):81-9.
22. Ahmed N, Khan Z, Chawla C. Comparison of Mulligan's Spinal Mobilization with Limb Movement (SMWLM) and Neural Tissue Mobilization for the Treatment of Lumbar Disc Herniation: A Randomized Clinical Trial. *J Nov Physiother*. 2016;6(304):2.
23. Thakur A, Mahapatra RK, Mahapatra R. Effect of Mulligan spinal mobilization with leg movement and shacklock neural tissue mobilization in lumbar radiculopathy: a randomised controlled trial. *J Med Thesis*. 2015;3:27-30.
24. Yadav S, Nijhawan MA, Panda P. Effectiveness of spinal mobilization with leg movement (SMWLM) in patients with lumbar radiculopathy (L5/S1 nerve root) in lumbar disc herniation. *Int J Physiother Res*. 2014;2(5):712-18.
25. Rustichelli R. L'Agopuntura nel trattamento della lombalgia cronica. XVIII Convegno AMIAR.19.

26. Vloka JD, Hadžić A, April E, Thys DM. The division of the sciatic nerve in the popliteal fossa: anatomical implications for popliteal nerve blockade. *Anesthesia & Analgesia*. 2001;92(1):215-7.
27. Heggannavar A, Das L. effect of mckenzie technique versus neural mobilization in chronic low back with radiculopathy—a randomized clinical trial. *indian journal of physical therapy*. 2015;3(1).
28. Clare HA, Adams R, Maher CG. A systematic review of efficacy of McKenzie therapy for spinal pain. *Australian Journal of Physiotherapy*. 2004;50(4):209-16.
29. Baqhoum S. Physiotherapeutic Rehabilitation Plan for a Patient after Disc Herniation at L3/L4 with Radiculopathy. 2018.
30. Al-Abdulwahab S. Back extension exercises decompress the spinal root and improve standing mobility in patients with sub-acute lumbosacral radiculopathy. *Somatosensory & motor research*. 2016;33(3-4):196-9.
31. Lam OT, Strenger DM, Chan-Fee M, Pham PT, Preuss RA, Robbins SM. Effectiveness of the McKenzie Method of Mechanical Diagnosis and Therapy for Treating Low Back Pain: Literature Review With Meta-analysis. *journal of orthopaedic & sports physical therapy*. 2018;48(6):476-90.
32. Francio VT, Towery C, Davani S, Brown T. Spinal manipulation and therapeutic exercises in treating post-surgical resurgent lumbar radiculopathy. *Oxford Medical Case Reports*. 2017;2017(10).
33. Tsirakis V, Perry J. The effects of a modified spinal mobilisation with leg movement (SMWLM) technique on sympathetic outflow to the lower limbs. *Manual therapy*. 2015;20(1):103-8.
34. Pourahmadi MR, Mohsenifar H, Dariush M, Aftabi A, Amiri A. Effectiveness of mobilization with movement (Mulligan concept techniques) on low back pain: a systematic review. *Clinical rehabilitation*. 2018;0269215518778321.
35. Waqqar S, Shakil-ur-Rehman S, Ahmad S. McKenzie treatment versus mulligan sustained natural apophyseal glides for chronic mechanical low back pain. *Pakistan journal of medical sciences*. 2016;32(2):476.
36. Shruti K, Chauhan N. Effect Of Mckenzie Technique Vs Pnf On Pain And Function In Non-Specific Low Back Ache Among Young Females: Gujarat University; 2018.
37. Schoenfeld AJ, Bono CM. Does surgical timing influence functional recovery after lumbar discectomy? A systematic review. *Clinical Orthopaedics and Related Research*. 2015;473(6):1963-70.