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on pain, nerve excitability and functional disability in patients with lumbar disc herniation and s8b device a rehbilitytion aprotocol whic

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e patient was made to lie supine and relaxed in the center of the bed with one pillow under the head; trunk and pelvis were in the neutral position. e therapist stood on the opposite side to the patient and placed one hand under the ankle joint and the other hand was placed above the knee joint. e a ected leg was raised perpendicular to

there is no pain. If this approach is successful, on subsequent visits, as the patient improves, assistant applies overpressure, provided there is no discomfort. Furthermore, [22] advocates that on the patient's rst visit, this technique should be performed only three times (rule of three) as a precaution against any latent exacerbation. On subsequent days three sets of six repetitions was applied. Six sessions with 48 hr interval between each were given.

Conventional Physiotherapy

Conventional physiotherapy was given in both the groups based on the recommendations of North American spine society clinical guidelines. It included moist hot pack (28×46 cm) which were kept under the temperature of 71-74°C was given for 15 minutes in prone lying position , TENS (Sonopulse 692V - Enraf Nonius, 4-Pole) two channel TENS with conventional mode is used. e unit produces an asymmetrical biphasic waveform, 100 Hz and pulse duration 125 μs. While the patient in the prone position four carbons rubber electrodes (3.5×5 cm) or vacuum electrodes are used positioned over the lumbar paraspinal muscles and other two over the course of tibial nerve (mid of posterior thigh and over the bulk of calf muscles). TENS was applied for continuous 20 minutes period [31] and supervised back strengthening exercise program consisting of pelvic tilts, Bridging, quadruped

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For this study twenty four (n=24) subjects were selected to compare the e ects of neural mobilization and mulligan spinal mobilization with limb movement. ese subjects were then randomly divided into two groups, group A (n=12) and group B (n=12). e demographic data is shown in Table 1.

ere was no signi cant di erence for the demographic characteristics between the groups. Both the groups were comparable in terms of age, height, weight and BMI which represents the homogeneity of participants (Table 1).

In the present study, data were assessed by a Shapiro-Wilk test for the normality of the distribution scores, as the sample size used in the study was less than y. Numeric pain rating scale (NPRS) scores that demonstrated non normal distribution were log- transformed for further analysis.

Comparison of baseline criterion measurement between the two experimental groups was done using independent t-test to prove the homogeneity between the groups. No signi cant di erence Numeric pain rating scale (NPRS), Modi ed Oswestry disability questionnaire (MODI) and Ho man re ex (H-re ex) latency was found between the groups (Table 2). Paired t test was used in order to compare the outcome variables at the baseline and Post-test measures in the neural mobilization group. ere was a signi cant di erence in all the variables except the H re ex latency of the una ected leg as shown in Table 3. Paired t test was used in order to compare the outcome variables at the baseline and Post-test measures in the Mulligan spinal mobilization group. ere was a signi cant di erence in all the variables except the H re ex latency of the una ected leg as shown in Table 4.

Comparison of post-test criterion measurement between the neural mobilization and Mulligan mobilization group were done by using independent t-test. ere was no signi cant di erence between the two groups on H-re ex latency of a ected leg where (*p*=412), but the mean di erence (0.63) shows better results in neural mobilization (M=28.35, SD=1.70) as compared to Mulligan mobilization group (M=28.91, SD=1.61). However there was a signi cant di erence between the groups in NPRS and MODI as shown in Figure 3 and Table 5.

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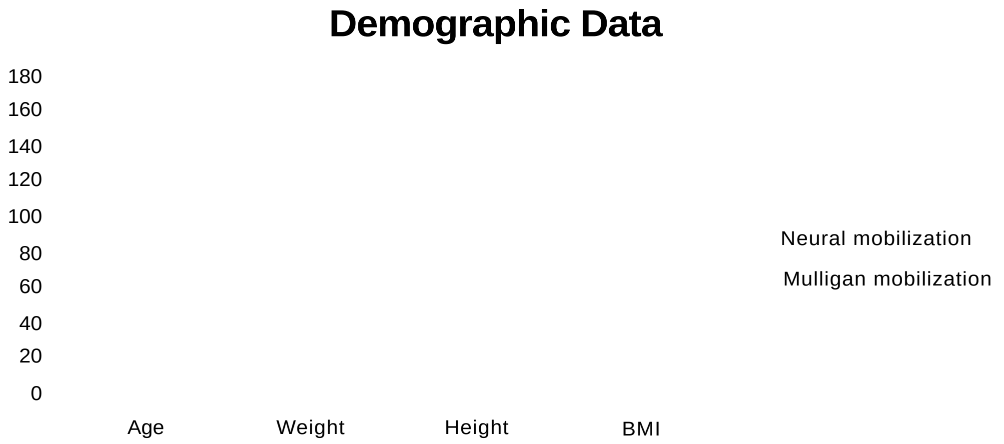

Figure 3: Demographic data of the subjects included in both the groups.

Variables	Neural mobilization group Mean (SD)	Mulligan mobilization group Mean (SD)	p-value	t- value
NPRS	0.30 (0.21)	0.57 (0.14)	0.002*	3.587
MODI	9.90 (5.87)	19.39 (7.27)	0.002*	3.514
H-refex 1	27.90 (1.74)	27.55 (1.76)	0.631	0.488
H-refex 2	28.35 (1.72)	28.91 (1.61)	0.412	0.491

NPRS: Numeric Pain Rating Scale; MODI: Modifed Oswestry Disability Questionnaire; H-refex 1: H refex latency of unaffected leg; H-refex 2: H-refex latency of affected leg.

Table 5: Comparison of post-test Criterion measures between groups.

intervention in neural mobilization group (*M*=0.30, *SD=0.21*) showed signi cant di erence, *t* (12)=10.432, *SEM*=0.056, *p*<0.001*. Similarly NPRS in Mulligan mobilization group also showed signi cant di erence between the baseline measurements (*M*=0.89, *SD*=0.05) and post-test measures (*M*=0.57, *SD*=0.14), *t* (12)=10.965, *SEM*=0.028, *p*<0.001*. However there was signi cant di erence between neural mobilization (*M*=0.30, *SD*=0.21) and mulligan mobilization (*M*=0.57, *SD*=0.14) in their post-test measurements t (24)=3.587, *p*=0.002* (Figure 4).

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When comparing baseline data of Neural mobilization (*M*=53.75, *SD*=8.93) and Mulligan mobilization group (*M*=52.59, *SD*=8.33) showed no di erence in modi ed Oswestry disability questionnaire (MODI), *t* (24)=0.331, *p*=0.744. In neural mobilization group when measured at the baseline (*M*=53.75, *SD* =8.93) and a er four weeks intervention (*M*=9.90, *SD*=5.87) data showed signi cant di erence, *t* (12)=27.389, *SEM*=1.60, *p*<0.001*. Similarly MODI in Mulligan mobilization group also showed signi cant di erence between the baseline measurements (*M*=52.59, *SD*=8.33) and post-test measures (*M*=19.39, *SD*=7.27), *t* (12)=16.914, *SEM*=1.96, *p*<0.001*. However there was signi cant di erence between neural mobilization (*M*=9.90, *SD*=5.87) and Mulligan mobilization group (*M*=19.39, *SD*=7.27) in their post-test measurements *t* (24)=3.514, *p*=0.002* (Figure 5).

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When comparing the baseline data of neural mobilization group for una ected (M=28.01, SD=1.68) and a ected leg (M=29.9, SD=1.97) with the Mulligan mobilization group for una ected (M=27.60, SD=1.73) and a ected leg (M=29.21, SD=1.64) respectively showed no di erence in H re ex latency, t (24)=0.589, p=0.562 (una ected leg) and t (24)=1.032, p=0.313 (a ected leg). While comparing the baseline measures of H re ex latency to see the di erence between una ected and a ected leg for Neural mobilization *t* (12)=8.16, *p*<0.001 and for Mulligan mobilization group *t* (12)=8.425, *p*=<0.001 showed signi cant di erence between the legs in both the groups, which means there was a signi cant variation in una ected and a ected legs . In neural mobilization group when measured at the baseline for a ected leg (M=29.9, SD=1.97) and a er four weeks of intervention (*M*=28.35, SD=1.72) data showed signi cant di erence, *t* (12)=6.957, *SEM*=0.233, *p*<0.001*,But there was no di erence for the una ected leg *t*(12)=1.16, SEM=0.09, *p*=0.270. Similarly H-re ex latency in Mulligan mobilization group also showed signi cant di erence between the baseline measurements for a ected leg (M=29.21, SD=1.64) and post-test measures a er four weeks of intervention (M=28.91 SD=1.61), *t* (12)=6.306, *SEM*=0.133, *p*<0.001*, and there was no di erence for the una ected leg. However when comparing the post H-re ex latency di erence between neural mobilization (*M*=28.35, SD=1.72) and Mulligan mobilization group (M=28.91 SD=1.61) for the a ected side in their post-test measurements *t* (24)=3.514, *p*=0.002* showed no statistically signi cant di erence but the mean di erence=0.63, shows better results in neural mobilization compared to mulligan mobilization group (Figures 6-8).

Di i n

e ndings of this study clearly demonstrate that both the techniques along with conventional physiotherapy have a great impact on pain, functional disability and nerve function as measured by H-re ex latency. e between group analyses was done using unpaired t-test and the result of the study con rm the hypothesis that there was a signi cant di erence between the two groups.

e results prove that the group which received neural tissue mobilization along with conventional physiotherapy was more e ective than spinal mobilization with limb movement (SMWLM); the patients in both groups showed pronounced e ects in improving pain and functional disability but the magnitude of response was signi cantly and clinically higher in the group B patients. e result of this study supports the fact that neural tissue mobilization does have a greater role in the management of lumbar radiculopathy compared to the traditional segmental joint mobilization techniques. e hypothesized bene ts of neural mobilization include facilitation of nerve gliding, reduction of nerve adherence, and dispersion of noxious uids, increased neural vascularity, and improvement of axoplasmic ow. ese results are in agreement with [38,39], who mentioned that if the nerve root gets impinged and microcirculation compromised it will lead to in ammation along the course of the nerve; moreover the presence of disc material in the epidural space causes direct toxic injury to the nerve by chemical mediation and then exacerbation of intra neuronal and extra neuronal swelling causing venous congestion and conduction block. ese ndings also support the study done by Mc Cracking [40], who concluded that without restoring the mechanics and the mobility of the nerve roots the radicular symptoms will not resolve. Hence it becomes clear from the results that altering nerve mechanics viae5guig n.1BQT/sa55tiouidume resultrn2sdover the

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