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Effects of Two Neural Mobilization Techniques in Sciatica: A Comparative Study

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ABSTRACT

Sciatica means pain along sciatic nerve distribution. The objective of the study was to compare the efficacy of sciatic nerve mobilization & flexion extension movements of head and cervical spine to improve neural mobility and function in patients with sciatica. 30 patients were taken for the study, divided into two groups: Group A and Group B. Both the groups were treated with IFT, ILT and back exercises. Group A was additionally given neural mobilization for sciatic nerve using SLR in addition. Group B was given flexion extension movements of head and cervical spine in addition. Modified Oswestry Back Disability Index Questionnaire, [6,7] and goniometric Range of Motion [8-11,22] of hip joint in SLR were taken at baseline after 7 days. There was improvement in both ROM of SLR and MODI score after 7 days. Both the techniques local sciatic nerve mobilization and flexion-extension movements of head and cervical spine are effective in improving neural mobility and physical disability in sciatica, local sciatic nerve mobilization using SLR being more effective of two in sciatica.

Key words: Sciatica, Neural mobilization

INTRODUCTION

Sciatica means pain along sciatic nerve distribution. The most important symptoms are radiating leg pain and related disabilities. [1] In about 90% of cases, sciatica is caused by a herniated disc with nerve root compression, but lumbar stenosis and (less often) tumors are also possible causes. [2] The annual prevalence of disc related sciatica in the general population is estimated at 2.2%. [3,4] Most patients with acute sciatica have a favorable prognosis but about 20%-30% have persisting problems after one or two years. [2]

Neural mobilization specifically directed at the sciatic continuum showed improvement in degrees of hip flexion during the straight-leg-raise and pain in patients with lower extremity neurogenic pain. [5] Neck movements, particularly flexion and extension produced changes in the position and tension in the lumbar spinal cord and nerve roots. This makes these movements useful clinically when increased neural tension in lower limb exists which is difficult for local mobilization. [6]

Very few studies have been done to see the effects of both the techniques and comparison of them which became the motivating factor for the current study and hence effect of local sciatic nerve mobilization and effect of flexion extension movements of head and cervical spine were compared in current study in Sciatica.

MATERIAL AND METHODS

Study design: Experimental study
Study Duration: The total duration of study was 1 year. The patients were treated for a period of 6 days, one session daily.
Sample Design: 30 patients were taken for the study.
Selection by random sampling, divided into two groups Group A and Group B.
Both the groups were treated with IFT, ILT and back exercises.

Group A was additionally given neural mobilization for sciatic nerve using SLR.

Group B was given flexion extension movements of head and cervical spine.

Inclusion Criteria:

1. Patients diagnosed with the Sciatica, sub acute and chronic cases
2. Age Group: 20-50 years
3. Patients who were to comprehend commands
4. Willingness to Participate
5. Normal ranges of cervical spine

Exclusion Criteria:

1. Patient having prolapsed intervertebral disc (Type III & IV)
2. Patient having spinal instability (osseous or ligamentous)
3. Patient having previous spinal surgery
4. Patient having infection and acute inflammation
5. Patient having severe osteoporosis
6. Patient having tumors of the nervous system and spinal cord
8. Patient having cauda equina
9. Patient having congenital anomaly of the spinal column and peripheral nerves
10. Patient having pregnancy
11. Patient having history of psychological or psychiatric illness
12. Patients having Benign Paroxysmal Positional Vertigo
13. Vestibular dysfunction
14. Any lower limb pathology that may directly affect the outcome measures

MATERIALS USED IN THE STUDY:-

1. Consent form
2. Maitland Lumbar Assessment Sheet.
3. Modified Oswestry Back Disability Index Scale
4. Interferential Therapy Machine
5. Intermittent Lumbar Traction Machine
6. High couch,
7. Stool
8. Paper, Pencil, Pin, hammer, stop watch
9. Goniometer

OUTCOME MEASURES AND FOLLOW UP PROCDURE:

Several recommended valid and reliable outcome measure questionnaires with proven psychometric properties for low back pain specific functional disability - Modified Oswestry Back Disability Index Questionnaire, [6,7] and goniometric Range of Motion [8-12] of hip joint in SLR were taken at baseline after 7 days.

MODIFIED OSWESTRY LOW BACK PAIN INDEX (MODI)

MODI SCALE is a self-assessing questionnaire.

- The questionnaire consists of 10 items addressing different aspects of function.
- Each item is scored from 0 to 5, with higher values representing greater disability.
- The total score is multiplied by 2 and expressed as a percentage.

RANGE OF MOTION OF SLR

Goniometric measurements of passive hip flexion during the SLR were used as an indication of the mechanosensitivity of neural structures of the sciatic continuum. The SLR was performed as described by Breig and Troup in the following fashion:

- The patient as positioned on a plinth in the supine position (no pillow) with her upper extremities resting by her side.
- The examiner, maintaining the ankle in neutral and the foot in the vertical plane, raised the leg slowly and asked the patient to signal the onset of pain.
- At this point, passive hip flexion was measured to the nearest degree, with a standard goniometer.

METHODOLOGY

Assessment

On the first visit, a complete orthopedic and neurological assessment was done. Subjects who were found suitable for the participation in the study were requested to sign Consent Forms. Pre-participation evaluation form consisted of VAS, Modified

Oswestry Back Index Scale, Range of SLR, Slump test and Assessment Chart.
Local Sciatic nerve mobilization

- The patient assumed a supine lying position on a plinth.
- The leg is raised until the "barrier" is felt i.e., the point at which tension is initially felt.
- The foot is then moved alternately into plantar flexion and dorsiflexion repeatedly for several cycles. [13]

Flexion-extension movements of head and cervical spine:

Subject was made to lie in supine on a high couch. Therapist would support subject's head in palm of her hand and ask the subject to move it out of the head end of the couch.

Therapists fingers will be interlocked supporting the cervical spine and occiput adequately and the thumbs would be placed on mastoid process (temporal bone).

On achieving adequate relaxation, therapist moves the subject's head and cervical spine rhythmically into alternate flexion and extension in full range. It was done in two sets of 10 repetitions spaced by an interval of 10 seconds.

A pilot study was done on 30 normal individuals and effect was seen which was found to be effective to improve ROM of SLR significantly

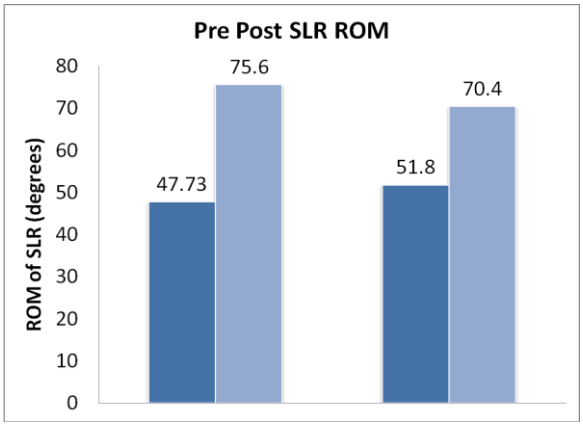
RESULTS

Paired t- test was applied to analyze the difference of ROM of SLR before and after the intervention for both groups.

For SLR ranges the difference was as follows

Both Group A and Group B results showed Significant Difference in Improvement in ranges of SLR at p< 0.001.

	Pre	Post	t- value	P value
Group A	47.73±6.52	75.6 ± 6.91	15.01	<0.0001
Group B	51.8 ± 6.81	70.4 ± 5.8	15.12	<0.0001

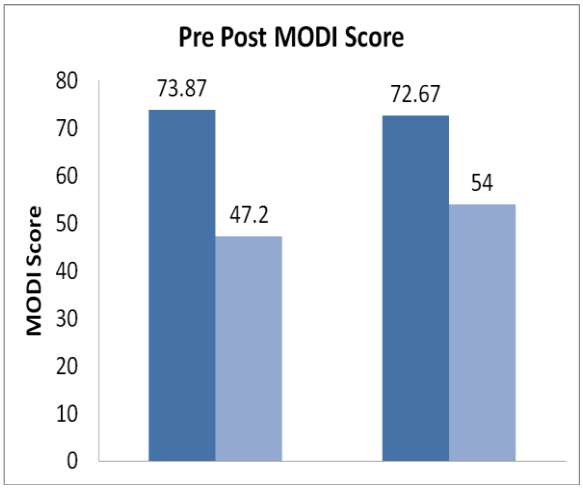


Wilcoxen signed Rank test was used to analyze the difference in score of MODI before and after intervention in both the groups.

For MODI scores the difference was as follows:

Both Group A and Group B results showed Significant Difference in Improvement on MODI score at p<0.001

	Pre	Post	W -value	P value
Group A	73.87±9.72	47.2 ± 9.13	120	=0.0017
Group B	72.67 ± 7.58	54 ± 6.97	120	=0.0005

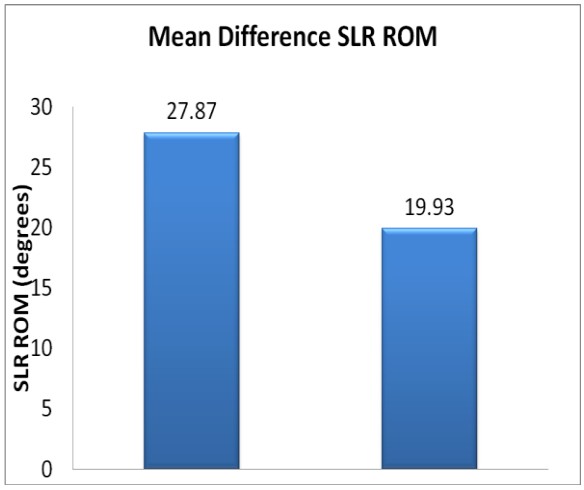


The Un-paired student's t-test was applied for the comparison of SLR ROM between the groups.

The SLR ROM mean of differences shows significant difference between the groups.

(t= 3.481, P<0.0001)

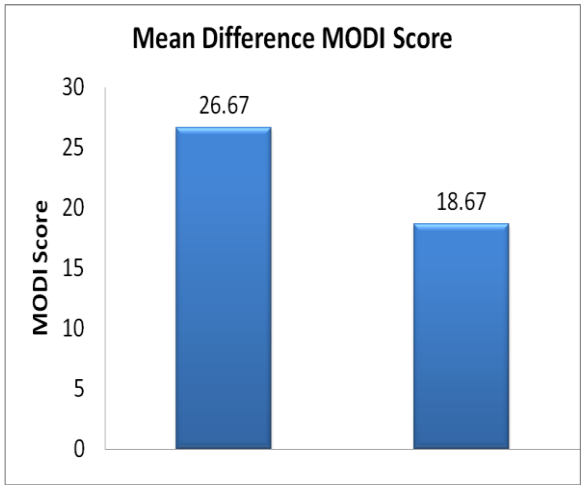
	ROM of SLR
Group A	27.87 ± 7.19
Group B	19.93 ± 5.12



Mann Whitney U test was used for Comparing Group A and Group B for the difference in scores of MODI.

The MODI score mean of differences shows significant difference between both the groups. (U=28.50 , P=0.005)

	Score of MODI
Group A	26.67 ± 6.83
Group B	18.67 ± 2.99



DISCUSSION

The results of group A showing improvement in ROM of SLR and Physical disability before and after application of local Sciatic Nerve Mobilization can be explained on the basis of same mechanism as proposed by a case study done by Clenad et al in 2006.

This single-case design provides a measure of scientific support for the use of neural mobilizations with patients presenting with lower extremity neurogenic pain disorders. [14]

Donald R Murphy et al in 2006 have done a study on 57 patients with lumber spinal stenosis. Patients were given treatment with Distraction Manipulation and Neural Mobilization and Exercises. They have concluded that Distraction Manipulation and Neural Mobilization are safe and effective for patients with lumber spinal stenosis. [15]

Neural Mobilization help by releasing perineural adhesions, reducing traction strain on nerve roots. [15]

Neural mobilization can have positive impact on symptoms by improving intra-neural circulation exoplasmic flow, neural connective tissue viscoelasticity and by reducing sensitivity of AIGs (Altered Impulse Generating Systems). [16,17]

The results of group B showing improvement in ROM of SLR and Physical disability before and after application of flexion extension movements of head and cervical spine can be explained by following mechanisms.

The nervous system is mechanically and physiologically continuous structure from brain to the end terminals in periphery. Mechanical or physiological changes anywhere in CNS can implicate the whole nervous system. [16] Neck movements**,** particularly flexion and extension produced changes in the position and tension in the lumbar spinal cord and nerve roots**.** [18] This makes these movements useful clinically when increased neural tension in lower limb exists which is difficult for local mobilization as cervical flexion could influence lumbosacral nerve roots. [20] More recent studies by Tencer et al (1986) have further supported the same. [18] In full flexion, the spinal canal lengthens up to 97 mm, the greatest average lengthening is in cervical region i.e. 28 mm each. [19]

The spinal neuraxis and meninges accommodates to canal elongation and bending by ventral displacement, lengthening / strain, axial sliding and angulations of nerve roots. Ventral

displacement takes place because the neuraxis takes the shortest route between canal ends causing it to bowstring forewords. [18] Strain / elongation can occur either along the entire length of the neural tract or segmentally. The neuraxis stretches first by the tightening the slack of the meninges and then by the stretching of the cord. [20] Axial sliding takes place in caudal direction. Cervical flexion – extension causes convergence of neuraxis and meninges maximum at C5 in spite of simultaneous lengthening. [19]

Nerve root angulation takes place from extension to flexion, follows dural convergence towards C5-6. [21] In the extension movement of spine, the spinal canal shortens as much as 38 mm, causing neuraxis to slacken and increase in cross-sectional area. The spinal cord moves posteriorly in the spinal canal and produces relaxation in neuraxis and results in transverse folds in dura matter. [18]

The effects can be in accordance with an article by Shacklock which states that there is a reduction in the symptom response to the median neurodynamic test 1 (MNT1) with performance of a contra lateral MNT1.

Dr Alf Breig provided a possible answer to this conundrum in 1960 with his observations of spinal cord and nerve root movement in cadavers. He showed that nerve root tension reduces when the spinal cord displaces caudad/downward in the canal. [16]

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SLR treatment has also been used for reducing cervical nerve root tension. SLR pulls the cord downward in the canal which produces a reduction in tension in the cervical nerve root. [16]

It has been assumed that the level or type of activity of the subject between two subsequent recording outcome measures will not be affecting the study findings. This needs verification as the amount of neural mobilization occurring with respect to normal functional activities could not be verified and recorded. One of the limitations of the current study was a small sample size. A future study with a larger sample size is required.

The back exercises performed were according to the bias of the patient and not same for all 30 patients.

Patients receiving back extension exercises may show reduction in neural tension so isolated effect of neural mobilization could not be ruled out.

Also it was assumed that N-SAIDs like drugs will not affect the outcome measure. It may affect the ROM of SLR which is assumed to be null in this study.

CONCLUSION

It has been concluded that both the techniques: local sciatic nerve mobilization and flexion-extension movements of head and cervical spine are effective in improving neural mobility and physical disability in sciatica, local sciatic nerve mobilization using SLR being more effective of two in sciatica.

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