Original Research Article

Comparative Efficacy of Hip Flexor Muscle Strengthening with Femoral Nerve Stretching and Facet Joint Mobilization for Lumbar Spondylitis

Sreenivasu Kotagiri[1*], Neeti Mathur[2], Ashwin Kumar[3]

[1]Assistant Professor, [2]Mpt IInd year, [3]MS Orthopedic Surgeon
KIMS College of Physiotherapy and Hospital, Hyderabad, Telangana, India
[*]Corresponding author email: **srinivaskotagiri88@yahoo.com**

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Abstract

Background: Lumbar Spondylitis (LS) is a common term that denotes degenerative changes that develop in trauma-center patients, specific age groups, and head injury patients. A study done on Indian population reported 60% to 90% of radiological changes of L4 at L5-S1 levels in asymptomatic individuals. These degenerative changes in the lumbar spine may remain asymptomatic or can present as pure axial lumbar pain, lumbar radiculopathy, lumbar myelopathy, or lumbar myeloradiculopathy. So, the aim of the study was to check the effectiveness of hip flexor muscle strengthening, femoral nerve muscle stretching with facet joint mobilization for lumbar spondylitis.

Materials and methods: 60 patients were included in the study which was divided into two groups; Group A and Group B, 30 patients in each group. Subjects were randomly selected and assigned to each group. Pre-test measurements of the patient were done with the help of two measures - Roland-Morris Low Back Pain and Disability Questionnaire for disability and Visual Analog Scale (VAS). Goniometer was used for range motion of lumbar spine movements done in each group. The Subjects in Group-A were given hip flexor muscles strengthening with femoral nerve stretching for lumbar region for 45 minutes for 4 days in a week for four weeks where the subject were sitting. The Subjects in Group-B were given femoral nerve stretching with facet joint mobilization for 45 minutes for 4 days in a week for four weeks where the subjects were in supine and prone position and remain

relaxed with the feet uncrossed. Result analysis was done by Wilcoxon Sum Rank Test (Mann Whitney U Test).

Results: On comparing Group A and Group B for post-treatment VAS score and RMQ score, results showed a significant difference (p=0.001) in improvement in terms of VAS and RMQ. The overall study proved that hip flexor muscle strengthening, femoral nerve stretching with facet joint mobilization for lumbar spondylitis in improving Pain and decreasing the disability level in lumbar radiculopathy and reduce tightness subjects.

Conclusion: The analysis obtained indicated that Group B (femoral nerve stretching with facet joint mobilization) showed more significant improvement when compared to Group A (hip flexor muscles strengthening with femoral nerve stretching).

Key words

Lumbar Radiculopathy, Hip Flexor Muscle Strengthening, Femoral Nerve Stretching, Facet Joint Mobilization, VAS, RMQ, Goniometer.

Introduction

Low back pain is one of the most common musculoskeletal complaints encountered in clinical practice. It is the leading cause of disability in the developed world and accounts for billions of dollars in healthcare costs annually [1]. Although epidemiological studies vary, the incidence of low back pain is estimated to be anywhere between 5% to more than 30% with a lifetime prevalence of 60% to 90%. Most occurrences of low back pain are self-limited and resolve without intervention. Approximately 50% of cases will resolve within one to two weeks. 90% of cases will resolve in six to 12 weeks [2]. The differential for low back pain is broad, and among other diagnosis, should include lumbosacral radiculopathy. Lumbosacral radiculopathy is a term used to describe a pain syndrome caused by compression or irritation of nerve roots in the lower back. It can be caused by lumbar disc herniation, degeneration of the spinal vertebra, and narrowing of the foramen from which the nerves exit the spinal canal. Symptoms include low back pain that radiates into the lower extremities in a dermatomal pattern. Other accompanying symptoms can include numbness, weakness, and loss of reflexes, although the absence of these symptoms does not exclude a diagnosis of lumbosacral radiculopathy [3].

Neurodynamic concepts can be traced to Cyriax's work on Dural pain and theories on adverse neural tension (ANT) as described by Maitland, Elvey and Butler. The peripheral nervous system is surrounded by connective tissue forming a "neural container." If a nerve is not able to slide or glide freely within this mechanical interface, adverse neural tension may result ANT has been described in many ways. Butler defines it as "an abnormal physiological and mechanical response produced from nervous system structures when their normal ranges of movement and stretch capabilities are tested". Controversy still exists regarding the cause of the decrease in range of movement. Elvey, et al. suggested it may be a result of secondary protective muscle spasm due to increased stimulation of the nerve prior to motion [4].

A person's hip flexors are the muscles that surround the ball and socket joints that connect the legs to the upper body. These muscles are vital to the movement of the lower body. The hip flexors, which consist of five distinct muscles, are often a neglected muscle group. It is not uncommon for even exercise enthusiasts to leave out exercises that strengthen and stretch these Muscles. A person should keep the hip flexors well-stretched and strong to help avoid injury or prevent existing injuries getting worse [5].

Lumbar mobilization is a common manual therapy technique used to decrease low back pain (LBP) and increase lumbar spine range of motion

[1]. During mobilization, the clinician's hands produce oscillatory movements of a specific grade (grades I- IV) to a single vertebra of the lumbar spine [1]. The underlying mechanisms of joint mobilization are still unclear. Joint mobilization may induce several physiological responses including pain reduction, improved joint mobility, hypoalgesia, and change in muscle activity/contraction [2]. It has been proposed that joint mobilization stimulates mechanoreceptors in the joints and muscles, which may alter muscle activity by stimulating α-motor neurons at the spinal level [3] and the neurons of the periaqueductal gray in the midbrain By removing the restriction by mobilization the source of pain is reduced and the patient experiences symptomatic relief. This results in gentle mobilizations being used for pain relief while more forceful, deeper mobilizations are effective for decreasing joint stiffness [6].

Materials and methods

Sample collection: Simple Random Sampling.
Source of data: This study was conducted in Kim's college of Physiotherapy and Hospital, in and around clinics, Hospital Hyderabad.
Sample selection: 60 patients. Group A: 30 patients. Group B: 30 patients.
Study duration: 4 days per week for 4 weeks, one session daily.
Outcome measure:

- Roland-Morris Low Back Pain and Disability Questionnaire (RMQ)
- Vas Scale
- Goniometer

Inclusion criteria

- Both Genders Male and Female
- Age limit 25 -50 Years
- Unilateral L4-L5-SI Radiculopathy Pain
- Slump Test, SLR and Thomas test, Prone Knee Bend test were performed on each subject
- Decreased Lumber, and Hip ROM
- Decreased Dermatomes and Myotome
- Radiating pain from lumber to lower limb more than 3 weeks with SLR test positive, slump distraction test positive
- Physical impairment unrelated to the spine that would prevent the subjects from safely participating in any aspect of the study.

Exclusion criteria

- Fracture of the lumber spine.
- Lumber instability/ Ankylosis spondylosis/ Spondylolisthesis.
- Bilateral Lower extremity radicular symptoms
- Hypermobility joints
- Tumor
- Tuberculosis spine
- Osteoporosis
- Ligaments laxity
- Dislocation of Hip

Method

All the subjects were informed in detail about the type and nature of the study. The subjects were divided into two groups; Group A and Group B, 30 patients in each group. All the subjects were randomly selected and assigned to each group. A pretest measurement with the help of two measures - Roland-Morris Low Back Pain and Disability Questionnaire (RMQ) and Visual Analog Scale (VAS) goniometer for range of motion lumber spine movements was done in each group [19, 20, 21].

Procedure

The Thomas test and the Prone Knee Bend test were performed on each subject by a single qualified physical therapist certified in manual therapy and who is a board certified orthopedic specialists. Subjects were assigned to patient and non-patient groups. The test order was alternately varied to prevent a testing effect.

The Thomas test was performed with the patient lying supine with a pressurized biofeedback bladder (The Stabilizer from Chattanooga) under the lumbar spine inflated

to 40 mmHg to ensure accuracy in determining the outcome. The examiner flexed both of the subject's knees up to their chest and instructed them to hold one knee while the other was slowly lowered passively to the table [16, 17]. The test was positive if the pressure in the bladder deviated less than 40 mmHg before the leg reached the table due to an anterior tilt of the pelvis. Hip range of motion deficit (Hip ROM Deficit) was recorded via measurement with a universal goniometer. While a positive Thomas test is indicative of tightness in the hip flexors, false positives may be related to weakness in the abdominal musculature, lumbosacral joint instability, or immobility of the hip joint. The test was repeated on the opposite leg and the results were compared. While inter rater reliability was not established, utilization of this device was intended to assist in monitoring anterior tilt of the pelvis (positive sign) in an objective manner. There is little research related to the reliability and validity of the utilization of this device with the Thomas Test at this time. The PKB test, also known as the femoral nerve stretch test, has received little attention in clinical research [1, 15].

First described by Cyriax in 1947 Nadler, et al. reported on the commonality of false positives due to tight muscles and devised the crossed femoral stretch test, which may improve the specificity of the femoral nerve stretch test. For this reason, we believe that the PKB test should be performed in conjunction with the Thomas test to assess tightness or facilitation in the hip flexor musculature. The Prone Knee Bend test for femoral nerve tension was performed subsequently on each side with the subject lying prone. The examiner passively flexed one knee slowly as far as possible until the heel touched the buttock, ensuring 0° of hip rotation. The test was positive if there was a reproduction/report of unilateral neurogenic pain (subjectively described as "sharp," "burning," "tingling," "pins and needles," "hot poker," etc.) was felt along the lumbar area, buttock, anterior thigh. Knee ROM (ROM PKB) was recorded via universal goniometry at the degree upon which the subjective symptoms were reported. A positive sign is indicative of tension of the femoral nerve or the lumbar nerve roots. Little is known regarding the reliability and validity of the PKB test [7, 8, 10].

The hip strengthening exercise: The patient needs to be in a sitting position. An elastic resistance strap is used to do this exercise. The patient is sitting on the table. The elastic resistance strap is attached to the table leg 10 cm above the ground. The other side of the resistance strap is attached around the foot of the patient's affected hip. The patient performs the required movements. The patient should perform three sets of 20 repetitions on the affected side. Patients can experience fatigue in the posterolateral hip region when they are performing the strengthening exercises. The strengthening exercises include Internal Rotation, External Rotation, and Extension. The Weight bearing Strengthening exercises needs to be performed four days per week and only on the affected side for four weeks [8, 13].

Facet Joint Mobilization is done in two ways, one is Posterior to Anterior glide and another is lateral glide. In Lumbar Spine Posterior to Anterior Glide the main Purpose is to increase segmental mobility and pain relief. The patient is lying prone; the therapist's ulnar border of one hand is over the spinous process to be treated while the other hand reinforces the mobilizing hand by resting on top of it and grasping the radial border of the wrist with the fingers [11, 12]. Keep your shoulders directly over your hands; this technique can be modified to provide unilateral pressure to the transverse process using your thumbs adjacent to one another. Mobilization is performed in a gentle rocking motion providing an anteriorly directed force over the spinous process. The main purpose of Lumbar Lateral Glide is to increase segmental mobility and pain relief.

The patient is lying prone with the therapist's thumbs (one on top of the other) on the lateral side of the spinous process that needs to be mobilized. Mobilization is applied in a horizontal pressure to the lateral border of the spinous process. The mobilization needs to be performed four days per week for four weeks [22, 23].

Results

Wilcoxon Sum Rank Test (Mann Whitney "U" Test) was applied for between-group comparison of Group A and Group B, and it was as follows.

For On comparing Group A and Group B for post-treatment VAS score, results showed a significant difference in improvement in terms of VAS.

For On comparing Group A and Group B for post-treatment RMQ score, results showed a significant difference in improvement in terms of RMQ.

Group A received treatment for a period of 4weeks and 4 days a week. The outcome measures were RMQ and VAS for disability, Pain and goniometry for a range of motion [28, 29]. Values were taken before and after completion of treatment. They were then assessed statistically [25, 26, 27].

RMQ in group A. prior to treatment, the mean score was and 18.80±2.43 decreased to 13.00±2.21 after treatment. There was a significant improvement in their function by 5.800.

VAS in group A. prior to treatment, the mean score was and 7.10±1.12 decreased to 4.17±0.87 after treatment. There was a significant improvement in their function by 2.933.

The range of motion was considered in all planes, Flexion, Extension, Lateral flexion, Rotation was considered.

In flexion, pre-treatment mean score was 39.50±5.14 degrees and post-treatment it was 48.67±5.86 degrees. There was a significant increase in the range of flexion by -9.167 degrees.

In extension pre-treatment mean was 20.80±3.63 degrees and post-treatment mean score was 28.07±2.18 there was a significant increase of -7.267 degrees (**Table – 1**).

In the rotation, the pre-treatment means score was 16.63±3.02 degrees and post-treatment was 22.80±3.11 degrees. There was a significant increase of -6.167degrees after the treatment.

Group B femoral nerve stretching with facet joint mobilization for disability, Pain and goniometry for a range of motion Values were taken before and after completion of treatment. They were then assessed statistically.

RMQ in group B prior to treatment the mean score was 18.80±2.43 and decreased to 8.63±2.01 after treatment. There was a significant improvement in their function by 10.167 degree.

VAS in prior to treatment McKenzie Exercises with Neural Mobilizations the mean score was 7.10±1.12 and decreased to 2.97±0.76 after treatment. There was a significant improvement in their function by 4.133 degree.

The range of motion was considered in all planes. Flexion, extension, rotation ROM was considered.

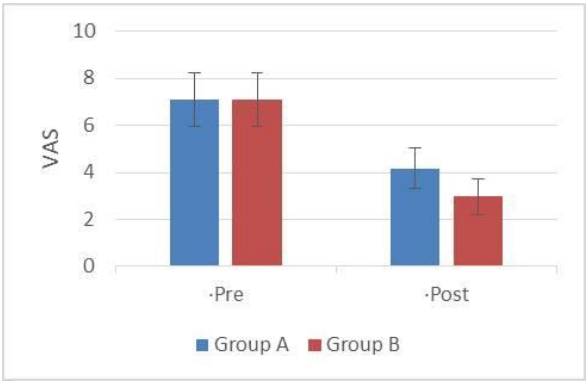
In flexion, pre-treatment mean score is 39.50±5.14 degrees and post-treatment it is 54.33±4.50 degrees. There is a significant increase in the range of flexion by -14.833 degrees.

In extension, pre-treatment means the score was 20.80±3.63 degrees and post treatments mean score was 28.80±2.02. There was a significant increase of -8.000 degrees (**Graph – 1 to 5**).

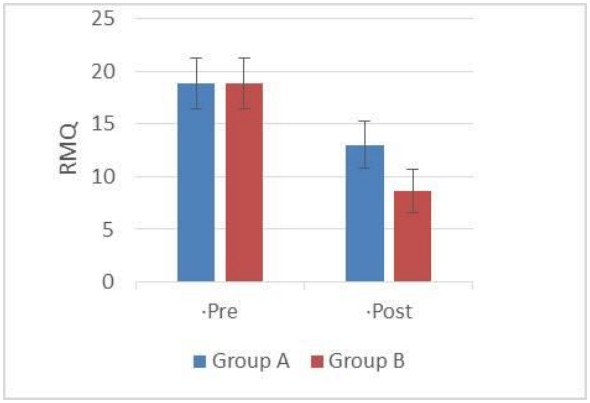
Table - 1: Comparison of study variables in two groups of patients study at pre and post assessment.

Variables/Time	Group A	Group B	Total	P value
VAS				
• Pre	7.10±1.12	7.10±1.12	7.10±1.12	1.000
• Post	4.17±0.87	2.97±0.76	3.57±1.01	<0.001**
• difference	2.933	4.133	3.533	-
• P value	<0.001**	<0.001**	<0.001**	-
RMQ				
• Pre	18.80±2.43	18.80±2.43	18.80±2.41	1.000
• Post	13.00±2.21	8.63±2.01	10.82±3.04	<0.001**
• difference	5.800	10.167	7.983	-
• P value	<0.001**	<0.001**	<0.001**	-
Flexion				
• Pre	39.50±5.14	39.50±5.14	39.50±5.10	1.000
• Post	48.67±5.86	54.33±4.50	51.50±5.92	<0.001**
• difference	-9.167	-14.833	-12.000	-
• P value	<0.001**	<0.001**	<0.001**	-
Extension				
• Pre	20.80±3.63	20.80±3.63	20.80±3.60	1.000
• Post	28.07±2.18	28.80±2.02	28.43±2.12	0.182
• difference	-7.267	-8.000	-7.633	-
• P value	<0.001**	<0.001**	<0.001**	-
Rotation				
• Pre	16.63±3.02	16.80±3.34	16.72±3.16	0.840
• Post	22.80±3.11	24.00±2.03	23.40±2.68	0.082+
• difference	-6.167	-7.200	-6.683	-
• P value	<0.001**	<0.001**	<0.001**	-

Graph – 1: VAS.



Graph – 2: RMQ.



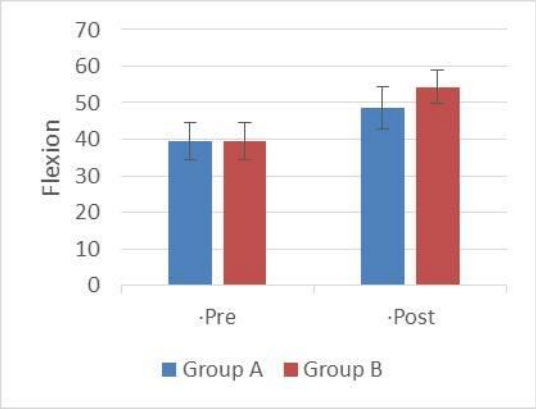
In Rotation, the pre-treatment score was 16.80±3.34 degrees and post-treatment was 24.00±2.03 degrees. There was a significant increase of -7.200 degrees after the treatment.

Discussion

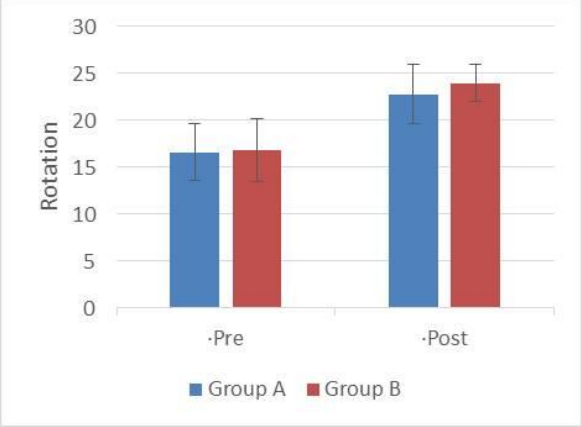
Discussion the overall study proved that both hip flexior strengthening exercises with femoral nerve stretching and facet joint mobilization is effecting in range of motion and decreases pain

level in lumber pain subjects Turlse help in improving patients symptoms by correcting minor positional fault and patients symptoms by correcting minor positional faults and by the neurophysiology mechanics according to Efstathiouma neural mobilization a hypoalgesia and concurred symptom as excitation it has been previously proposal that the combination sympathetic excitation hypoalgesia and improvement in motor function are indirect signs of possible involvement of endogenous pain inhibitory systems in manual therapy treatment effects individuals with lumber radiculopathy show altered neurodynamic so neural mobilization technique was used to improve altered neurodynamic [14].

Graph – 3: Flexion.

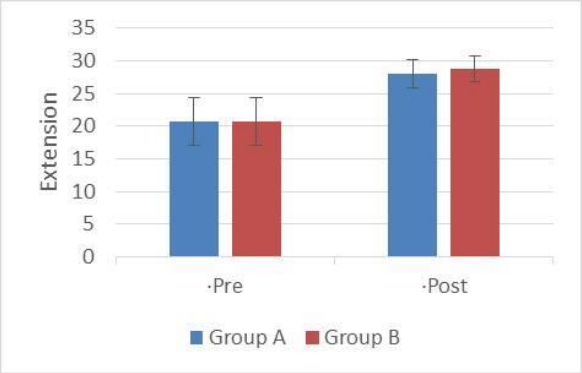


Graph – 4: Rotation.



A positive relationship between the two tests would suggest the importance of treating neural tension in conjunction with the muscle facilitation. The results of this study demonstrate a positive relationship between the two tests in both the normal and the patient populations. In the normal population, the relationship was small but statistically significant. It was anticipated that the normal population, having no injuries to the back, would test negative to both tests. These findings are clinically relevant when related to data obtained from the patient population, where the normal population tests negative to both tests and patients with low back pain test positive to both tests. A positive relationship was found to be large in the patient population. Mobilization of the femoral nerve can be conducted manually or via patient self-management [4, 5]. While detailed instruction regarding the treatment for ANT of the femoral nerve is beyond the scope of this paper, a general overview can provide insight to the clinical relationship between the presence of peripheral nerve dysfunction and intervention. The initial technique of neural mobilization should be non-provoking without causing an increase in patient symptoms. There should be continual monitoring of symptoms with constant verbal and nonverbal communication between the therapist and patient. A common slider technique for manually gliding the proximal aspect of the femoral nerve involves placing the patient on their contralateral side. The therapist stands behind the patient with the cephalad hand supporting and monitoring the ipsilateral hip and pelvis as the caudal hand supports the ipsilateral leg. The therapist then passively brings the hip into extension and performs slow and rhythmic oscillations. A distal slider technique for the femoral nerve can be performed in a similar fashion with the hip and knee flexed. It has been suggested that large amplitude Grade II mobilizations can be performed with consideration of patient symptoms. The technique can be modified with regard to the number of repetitions, amplitude, or amount of tension but it is important to continually assess the patient and only change one variable at a time. The technique can also be modified for self-mobilization while it has been suggested that the appropriate utilization of neural gliding techniques may be effective in reducing pain and dysfunction [18].

Graph – 5: Extension.



Joint mobilization an increases in the diameter of the inter vertebral foreman can induce an increases in blood flow through the blood vessels in spinal nerve and the inter vertebral foremen and increases blood flows can remove inflammatory exudate in addition spinal decompression therapy increased the generation of constant through decompression to improve the ability to bind to water so that the water content increases and the relief of degenerative changes enables increased nutrition supply therefore the space in the spinal cavity is widened and the paraspinal muscle and ligaments are extended to reduced secondary myofacial pain [24].

Conclusion

From the above study it is concluded that there is a difference in the Group A and Group B when the values obtained were analyzed. The analysis obtained indicated that Group B (femoral nerve stretching with facet joint mobilization) showed more significant improvement when compared to Group A (hip flexor muscles strengthening with femoral nerve stretching). Group B showed significant improvement in Range of Motion of all aspects such as flexion, extension and rotation. Roland-Morris Low Back Pain and Disability Questionnaire (RMQ) and Visual Analog Scale (VAS) have shown significant reduction indicating decreased level of disability and better functional ability. Thus the study indicated that femoral nerve stretching with facet joint mobilization showed more significant improvement when compared hip flexor muscles strengthening with femoral nerve stretching.

References

1. Chaitow L. Palpation Skills Assessment and Diagnosis through Touch. London: Churchill Livingstone. M. C., 2001.
2. Powell, M. Wilson, P. Szypryt. Prevalence of lumbar disc degeneration observed by magnetic resonance in symptomless women. The Lancet, 1986; 2(8520): 1366– 1367.
3. Shacklock M. A new system of musculoskeletal. Elsevier/Butterworth Heinemann, Edinburgh, UK, 2005.
4. Gallant S. Assessing adverse neural tension in athletes. J Sport Rehabil., 1998; 7: 128-139.
5. Turl SE, George KP. Adverse neural tension: a factor in repetitive hamstring strain? J Orthop Sports Phys Ther., 1998; 27: 16-21.
6. Efstathiou MA, Stefanakis M, Savva C, Giakas G. Effectiveness of neural mobilization in patients with spinal radiculopathy: A critical review. Journal of Bodywork & Movement Therapies, 2015; 19(2): 205-12.
7. The effect of stretching neural structures on grade one hamstring injuries. J Orthop Sports Phys Ther., 1989; 10: 481-487.
8. Hall & Brody. Therapeutic Exercise: Moving Toward Function, 2nd Edition, Lippincott Williams and Wilkins, 2005.
9. Spratt JD, Logan BM, Abrahams PH. Variant slips of psoas and iliacus muscles, with splitting of the femoral nerve. Clin Anat., 1996; 9: 401-404.
10. Jakubowicz M. Topography of the femoral nerve in relation to components of the iliopsoas muscle in human fetuses. Folia Morphol (Warsz), 1991; 50: 91-101.
11. Butler, DS. Jones Butler DS. Mobilisation of the nervous system. Churchill Livingstone, MA. Mobilization of the nervous system. London: Churchill Livingstone, 1991.

12. Maitland G, Hengeveld E, Banks K, English K. Maitland's Vertebral Manipulation. 7th edition, Oxford, England: Elsevier Butterworth Heinemann; 2005.
13. Bialosky JE, Bishop MD, Price DD, Robinson ME, George SZ. The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. Man Ther., 2009; 14(5): 531-538.
14. Sterling M, Jull G, Wright A. Cervical mobilisation: concurrent effects on pain, sympathetic nervous system activity and motor activity. Man Ther., 2001; 6(2): 72.
15. Boland RA, Adams RD. Effects of ankle dorsiflexion on range and reliability of straight leg rising. Aust J Physiother., 2000; 46: 191-200.
16. Hsieh CY, Walker JM, Gillis K (1983) Straight-leg-raising test. Comparison of three instruments. Phys Ther., 1983; 63: 1429-1433.
17. Rezk-Allah SS, Shehata LA, Gharib NM. Slump stretching versus Straight leg raising in the management of lumbar disc herniation Egypt J Neurol Psychiat Neurosurg., 2011; 48: 345-349.
18. Villafane JH, Pillastrini P, Borboni A. Manual therapy and neurodynamic mobilization in a patient with peroneal nerve paralysis: a case report. J Chiropr Med., 2013; 12: 176-181.
19. Roland MO, Morris RW. A study of the natural history of back pain. Part 1: Development of a reliable and sensitive measure of disability in low back pain. Spine, 1983; 8: 141-144.
20. Roland M, Fairbank J. The Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire. Spine, 2000; 25(24): 3115-24.
21. Dones, G. Messina, V. Nazzi, A. Franzini. A modified visual analogue scale for the assessment of chronic pain. Neurological Sciences, 2011; 32(4): 731–733.
22. Fitzgerald GK, Wynveen KJ, Rheault W, et al. Objective assessment with establishment of normal values for lumbar spinal range of motion. Phys Ther., 1983; 63: 1776-1781.
23. Hart FD, Strickland D, Cliffe P. Measurement of spinal mobility. Ann Rheum Dis., 1974; 33: 136-139.
24. Reynolds PMG. Measurement of spinal mobility: A comparison of three methods. Rheumatol Rehabil., 1975; 14: 180-185.
25. Anderson JAD, Sweetman BJ. A combined flexi-rule/ hydrogoniometer for measurement of lumbar spine and its sagittal movement. Rheumatol Rehabil., 1975; 14: 173-179.
26. Bernard Rosner. Fundamentals of Biostatistics, 5th Edition, Duxbury, 2000, p. 80-240.
27. Robert H Riffenburg. Statistics in Medicine, second edition, Academic press, 2005, p. 85-125.
28. Sunder Rao P S S, Richard J. An Introduction to Biostatistics, A manual for students in health sciences, New Delhi: Prentice hall of India, 4th edition, 2006, p, 86-160.
29. Suresh K.P., Chandrasekhar S. Sample Size estimation and Power analysis for Clinical research studies. Journal Human Reproduction Science, 2012; 5(1): 7-13.