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## Effectiveness of neural tissue mobilization and abdominal isometric exercises on function and disability in patients with sciatica

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### Abstract

**Introduction:** Sciatica is a disorder involving irritation of sciatic nerve due to disc herniation. The physiotherapy approaches for the treatment of sciatica is ice, rest, electrotherapy and exercise therapy, but evidences regarding their individual effectiveness are lacking. The purpose of the study was to determine, if Neural tissue mobilization along with Abdominal isometric exercise brings better improvement in pain or functional disability than Abdominal isometric exercise alone.

**Methodology:** The study was conducted on 30 female patients with posterolateral disc herniated sciatica treated in a physiotherapy department. Subjects were divided into 2 groups, Group A (n = 15) (Control group) received 4 weeks physiotherapy program including Abdominal isometric exercise. Group B (n=15) (experimental group) received 4 weeks rehabilitation program including Neural tissue mobilization along with Abdominal isometric exercise.

**Result:** At the beginning, both the groups were not significantly different in terms of score. After therapy, there was statistically significant improvement between groups in RDQ scores [Group A  $15.73 \pm 2.25$ ; Group B  $10.67 \pm 1.45$ ].

**Conclusion:** The study result reveal that Neural tissue mobilization along with Abdominal isometric exercise showed better RDQ scores as compared to subjects treated with Abdominal isometric exercise alone.

**Keywords:** Sciatica, neural tissue mobilization, abdominal isometric, RDQ

### Introduction

Sciatica is defined as sharp burning and radiating pain down in the leg, upto foot and ankle associated with numbness and paresthesia. The important symptom are radiating leg pain and disabilities caused by them [1]. Sciatica is mainly caused by herniated lumbar disc in almost 90% cases that leads to ipsilateral radiating leg pain [2]. The exact mechanism has not been described but compression of nerve root has been co-related with pain and neural dysfunction in segmental distribution of the specific nerve root. The compression of nerve tissue impairs the transport of nutrients to the tissue thus affecting the function of the nerve. Also there is local effect of substance leaking from the degenerated intervertebral disc that affects the nerve root [3]. Apart from disc prolapsed; there are various other causes of sciatica such as malignancy (metastatic, soft tissue malignancy, sarcoma, sciatic neuroma, haemangioblastoma); Infection (Abscess, Caseating disease, discitis); Vascular compression (abnormal pelvic venous plexi., Gluteal artery pseudoneurysm); Bony Compression (osteophyte-sacro-iliac, zygapophyseal joint, Spondylolisthesis, spinal stenosis); Muscular compression (piriformis syndrome); Epidural adhesion; Gynaecological (uterine fibroid, pelvic endometriosis) [4].

Various physical therapy interventions are used for the treatment of low back pain and sciatica. Conservative treatment mainly include modalities such as TENS, US, Cryotherapy and Heating modalities and Kinesiotherapy i.e ROM exercises and strengthening exercise [5]. In sciatica isometric exercise for abdominal muscles has shown to be effective intervention [6]. In isometric exercise muscle undergoes isometric contraction. There is development of force due to increase in intra-muscular tension without any change in the length of muscle [7]. Most important risk factor for low back pain in sciatica is weakness of superficial trunk and

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abdominal muscles [8-9]. Transverse abdominis and lumbar multifidus are most affected muscles in sciatic pain and strengthening of this muscle will help to improve core strength and its function [10-11].

Neural mobilization is also found to have great role in the treatment of radicular low back pain. Neural mobilization technique was designed to restore the plasticity of the nervous system. Neural mobilization was first described by the Maitland in 1985, refined in 1991 by the Butler; as an adjunct to physiotherapy treatment of neural pain syndromes including radiating low back pain. The goal of treatment is to increase the collagen flexibility responsible for the maintenance of nerve integrity and its movement in relation to the surrounding structures [5]. Neural mobilization aims to reconstruct the normal neuromechanical conditions i.e adapting the nervous system constantly changing loads and mechanical tensions [1].

Roland and Fairbank has developed Roland Morris Scale for Quality of Life RDQ; a health status measure which was designed that is to be filled by patients themselves to assess physical disability due to low back pain. It is found useful for monitoring patients in clinical practice. It was derived from the sickness impact profile (SIP) which contains 136-items assessing health status covering both physical and mental function. Authors have selected 24 items from the SIP which are most affected by Low back pain. Each item is qualified with the sentence “due to my back pain” so as to distinguish it from disability due to other causes. The Score Ranges from 0 (no disability) to 24 (maximum disability). RDQ is short, simple to complete and readily understood by patients [12].

**Methodology**

75 patients with symptoms of sciatica from Bhopal, Madhya Pradesh, India were selected as our study population. From these 54 patients volunteered to participate in our study. Out of these 36 patients were short listed who fitted into our selection criteria. From these, 30 were selected randomly by the computer generated random sampling table and further they were divided into two groups by the same method i.e Group A and Group B. Written consent was obtained from all 30 subjects after explaining the complete protocol of the study. Subjects were instructed to wear comfortable clothing preferably t-shirts and track pants. They were also explained that 3 readings will be taken during the study; 1<sup>st</sup> at Day 0, 2<sup>nd</sup> at completion of 2 weeks and 3<sup>rd</sup> at the end of the protocol. Subjects from Group A were explained about the abdominal strengthening exercise which they had to perform under supervision and subjects from Group B were instructed about the treatment they will be receiving as well as the abdominal strengthening exercise.

Subjects in both the groups were separately instructed how to perform the isometric exercise for abdominal muscles. The muscles that were targeted in this exercise were Transversus abdominis and Lumbar Multifidus. Subjects had to lie on her back with knees and hip flexed. While breathing normally, subject tucks in the abdomen and hold it for 10 seconds before relaxing. The treatment was given daily 3 set of 20 repetitions for 4 weeks. Subjects from Group B only received Neural tissue mobilization after Abdominal isometric exercise. Subject had to lie in the supine position and the therapist had to lift the subjects affected lower extremity in the SLR position and then hip is adducted and medially rotated and ankle dorsiflexion is added. These position of the lower extremity places tension on the sciatic nerve. These position is maintained and ankle joint is moved in few degrees in and out of the stretch position i.e ankle plantar flexion and dorsiflexion. Neural tissue mobilization was given daily 2 set of 20 repetition for 4 weeks. All the subjects were given treatment depending on their group for 4 weeks from the day they were recruited in the study.

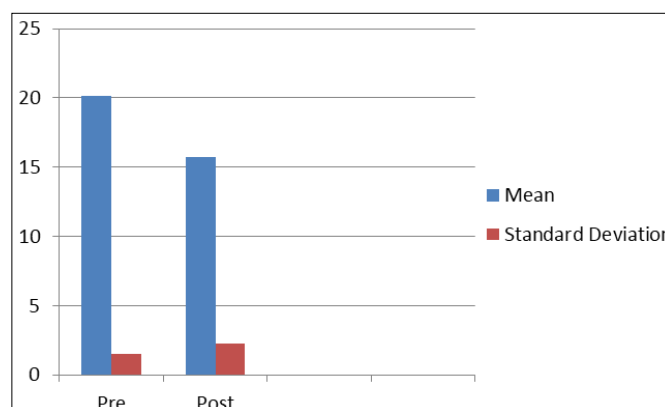
The Outcome Measure Roland-Morris Disability Questionnaire focuses mainly on the physical functions that is relevant to patients with back pain. Reliability of RDQ is good (r = 0.72). The Variables were as follows Independent Variable as Neural Tissue Mobilization, Isometric exercise and Dependent Variable as Quality of Life.

**Results**

In the study, Subjects in Group A received abdominal strengthening exercise and Group B subjects received neural tissue mobilization along with Abdominal strengthening exercise for 4 weeks. The paired t-test done within Group A shows that subjects had significant improvement (p=0.01) post treatment. Similarly in Group B also subjects showed significant improvement (p=0.01) post treatment. Later Mann-Whitney U test was used for comparing the mean values of Group A and Group B. This test revealed that after comparing the mean values between the two groups, the post test readings showed significant improvement. Also when comparing post-test values between the two groups, Group B showed more improvement as compared to Group A. Thus, we found that Neural Tissue Mobilization along with Abdominal strengthening exercise is more effective treatment for sciatica as compared to Abdominal strengthening exercise alone.

**Table 1:** Comparison of mean values of Group A using paired t-test.

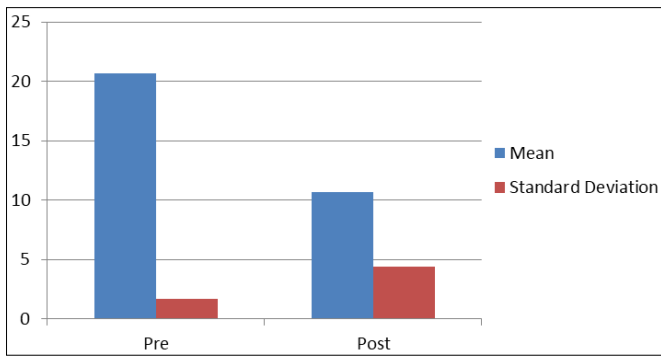
RDQ	N	Mean	S.D	t value	P value
Pre	15	20.13	1.55	t=14.40	p=0.001
Post	15	15.73	2.25		



**Graph 1:** Graph showing the Mean change in the Group A

**Table 2:** Comparison of mean values of Group B using Paired t-test.

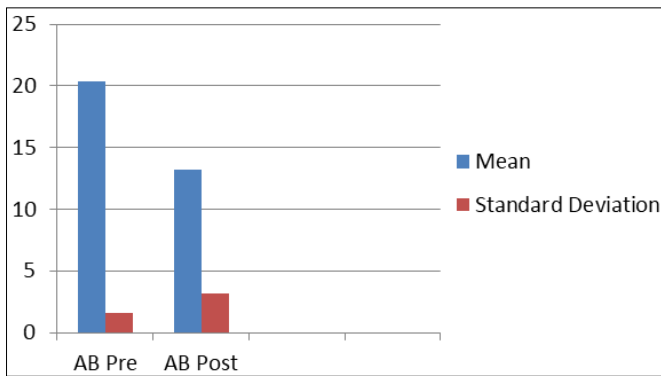
RDQ	N	Mean	S.D.	t value	p value
Pre	15	20.67	1.68	t=24.85	p=0.001
Post	15	10.67	1.45		



**Graph 2:** Graph showing the Mean change in the Group B

**Table 3:** Comparison of Mean values of Group A & Group B

RDQ	N	Mean	Median	S.D.	Z	Mann-Whitney U	2 tailed
Pre	30	20.40	20.00	1.61	-0.91	91.00	0.37
Post	30	13.20	13.00	3.18	-4.40	7.00	0.01



**Graph 3:** Graph showing the Mean change between Group A & B

**Discussion**

After studying 30 patients that were previously diagnosed with sciatica caused due to disc herniation (posterolateral disc herniation on MRI) and had a positive SLR test between 30-45°, these patients were selected after pre-screening done using Roland-Morris disability questionnaire. When we compared the mean values from both groups, we found that patients reported relief from the symptoms post treatment i.e. after completion of 4 weeks of treatment protocol. However, patients from Group B reported better improvement as compared to Group A.

T. Louis *et al.* reported that sciatica mostly occurs due to lumbar disc herniation, approximately in 90% cases and it is characterized by ipsilateral radiating leg pain other than an inflammatory response from nerve root irritation. There are several studies that suggest posterior disc herniation as the major cause of sciatica. It has been said that first line treatment for sciatica should be conservative. Bayramoglu *et al.* has said that sciatic patients also had weakness of Abdominal muscles mainly Lumbar multifidus and Transverse abdominis. Abdominal muscles and back muscles help in performing body movements and provide the strength to keep the body upright. Weak or tight muscle can cause painful spasm and overtime lead to worsening of back pain. Strengthening of these muscles reduces the severity of the symptoms. Colakovic *et al.* described neural tissue

mobilization as a set of technique which is designed to restore the plasticity of nervous tissue. The aim of Neural tissue mobilization is to increase the flexibility of collagen that maintains the integrity of the nerve tissue along with its relation to the other surrounding structures. It also aims to reconstruct the normal neurochemical condition i.e. nervous system adaptation to constantly changing loads and muscle tension. They also suggested that Neural tissue mobilization had a great role in the management of sciatica. Many researches shows that in sciatica; due to trauma, adhesions or scar tissue may form around the meninges and nerve roots or at the site of injury in the plexus or peripheral nerve. It has been found that Neural tissue mobilization enhances the outcome when done along with the strengthening exercises in the management of sciatica. We selected sciatica patients because it is very common problem among major group of population especially in females as females tend to neglect pain, thus, presenting aggravated symptoms. As stated previously back muscles tend to become weak due to disc herniation and also core stability is essential for proper load balance within the spine, pelvis and kinetic chain. By strengthening Abdominal muscles we are trying to compensate for weak back muscles and we assume that it will also relieve back pain. Along with this Neural tissue mobilization place tension on the sciatica nerve thereby increasing the flexibility of the nerve and also increases the range of SLR. This causes restoration of normal movement and also reduces the impairments due to LBP.

Thus, we founded that Neural tissue mobilization along with Abdominal strengthening exercise is more effective for the management of sciatica as compared to Abdominal strengthening exercise alone.

**Conclusion**

The study shows significant results that Neural tissue mobilization along with Abdominal isometric exercise is more effective in the management of sciatica than Abdominal exercise alone.

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