RESEARCH PAPER

Combined Effect of Contralateral Gluteus Medius Strengthening in Adjunct to Sciatic Nerve Flossing on Unilateral Sciatica in Middle Age Adults

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ABSTRACT

Background – Sciatica, a common musculoskeletal disorder is defined by radiating pain along the sciatic nerve course due to compression of the nerve roots. It affects 2–5% population & typically affecting only one side of the body.

Aim - To determine the combined effect of contralateral Gluteus Medius strengthening in adjunct to Sciatic Nerve Flossing on Unilateral Sciatica in middle age adults.

Methods-Total 70 participants were included divided into 2 groups: GROUP A (Control group) received Sciatic Nerve Flossing alone and GROUP B (Experimental group) received contralateral Gluteus Medius strengthening exercises in addition to Sciatic Nerve Flossing for 5 days/week for 4 weeks.

Outcome measures- NPRS (Numeric Pain Rating Scale), Sciatica Bothersomeness Index (SBI), Modified Aneroid Sphyganomanometer (MST)

Result- Effect of GROUP A was assessed by using Paired t Test. Effect of Group B was assessed by using Paired t Test. Comparison Between both GROUP was done by using unpaired t Test. Results indicated statistically significant reductions in NPRS & SBI scores and greater improvement in muscle strength measured by MST in Group B.

Conclusion- The contralateral gluteus medius training in addition to sciatic nerve flossing (Experimental group) is more effective than sciatic nerve flossing alone (Control group) in lowering pain & enhancing muscle strength. A combined approach may offer a low-risk, clinically feasible conservative management strategy for unilateral sciatica, especially during phases when ipsilateral loading is poorly tolerated.

Keywords – Unilateral Sciatica, Nerve flossing, Gluteus medius strengthening, NPRS (numeric pain rating scale), Sciatica Bothersomeness Index (SBI), Modified Aneroid Sphyganomanometer (MST)

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INTRODUCTION

Unilateral sciatica, characterized by pain radiating along the sciatic nerve from the lumbosacral region to the lower extremity, remains a major cause of disability among middle-aged adults.[1] The annual incidence ranges from 1–5%, while lifetime incidence is estimated between 10–40%.[1] Sciatica significantly affects pain, functional ability, and quality of life, and despite advances in treatment, many patients continue to experience recurrent episodes, delayed recovery, or persistent symptoms. Epidemiological evidence suggests that sciatica is associated with poorer outcomes than non-radicular low back pain (LBP). Middle age (40–60 years) is considered a critical period due to degenerative lumbar changes, increased occupational loading, and reduced musculoskeletal resilience, leading to greater healthcare utilization, work absenteeism, and higher risk of surgical referral.[2] Therefore, effective conservative physiotherapy interventions are highly relevant in this population.

Sciatica is a symptom rather than a diagnosis and typically presents as pain radiating from the buttock to the posterior or lateral aspect of the lower limb.[3] Its underlying mechanisms include nerve root compression or irritation, inflammation, altered neural biomechanics, and increased mechanosensitivity, most commonly involving the L4–S1 nerve roots.[1] Compression may result in intraneural oedema, demyelination, microvascular compromise, and conduction dysfunction. Inflammatory mediators from disc herniation or degenerative changes can further sensitize nerve roots, causing pain even in the absence of substantial mechanical compression.[4] Reduced neural mobility or gliding contributes to increased neural tension and abnormal pain responses, disrupting normal movement patterns.[4] These pathophysiological mechanisms support interventions aimed at restoring neural mobility, reducing mechanosensitivity, and improving musculoskeletal support around the hip, pelvis, and lumbar spine.[5]

Conservative treatment remains the first-line approach for unilateral sciatica in the absence of red flags requiring surgery. Standard management includes patient education, analgesics, activity modification, spinal manual therapy, strengthening exercises, core stabilization, and neural mobilization techniques. Neural mobilization (NM), also known as neurodynamics, nerve gliding, or nerve flossing, has gained increasing attention in managing radicular disorders. A systematic review reported that adding NM to conventional therapy improved pain, disability, and functional outcomes in most randomized controlled trials.[2] A recent metaanalysis further demonstrated significant reductions in pain and disability with NM in lumbar radiculopathy.[8] Neural mobilization aims to restore nerve sliding, reduce intraneural pressure, improve intraneural fluid dynamics, and decrease mechanosensitivity.[9] Emerging evidence also suggests possible central and peripheral neural adaptations following NM.[4] Despite encouraging results, variability in treatment protocols and limited long-term evidence continue to restrict definitive clinical recommendations.[12]

The gluteus medius (G. medius), innervated by the superior gluteal nerve (L4–S1), is an essential hip stabilizer responsible for hip abduction, pelvic stability, and regulation of femoral movement.[13] Weakness or impaired activation of the gluteus medius may increase lumbar loading, alter gait mechanics, and indirectly contribute to persistence of radicular symptoms.[15] Furthermore, strengthening of the gluteus medius has been associated with improvements in pain and function in various lumbar and lower-limb conditions.[16] These findings support the inclusion of hip abductor strengthening within rehabilitation programs for unilateral sciatica.

An additional rehabilitation concept relevant to unilateral conditions is cross-education, where unilateral strengthening of the unaffected limb produces strength and functional gains in the affected limb.[18] This effect is thought to occur through neural adaptations such as increased cortical excitability and interhemispheric communication rather than peripheral hypertrophy.[19] In acute unilateral sciatica, where direct ipsilateral strengthening may aggravate symptoms, contralateral gluteus medius strengthening offers a practical and non-invasive alternative to maintain or improve function.[21]

Neural mobilization techniques such as nerve flossing are designed to restore normal neural movement and reduce mechanosensitivity.[22] Techniques utilizing movement from both ends of the nerve bed have demonstrated greater nerve excursion than single-joint approaches.[23] Sciatic nerve flossing may reduce neural discomfort and improve tolerance to limb movement.[24] Simultaneously, strengthening the contralateral gluteus medius can enhance pelvic alignment and reduce abnormal mechanical loading that may perpetuate neural irritation.[25] Through cross-education, such strengthening may also improve motor control and strength on the symptomatic side without directly provoking neural pain.[26]

The role of myofascial chains and muscular slings further supports this combined therapeutic approach. Myofascial chains represent interconnected muscular and fascial systems that coordinate posture, stability, and movement.[27,28] Structures such as the thoracolumbar fascia, sacrotuberous ligament, and posterior oblique sling facilitate force transmission between the trunk and lower limbs.[29] Hip abductors, particularly the gluteus medius, are strongly connected to lumbar musculature through these fascial networks, and weakness in these muscles has been significantly associated with low back pain.[30,31] Therefore, combining neural flossing with contralateral gluteus medius strengthening may simultaneously address impaired neural mechanics and deficient lumbopelvic support, potentially producing additive or synergistic improvements in pain and function.[32]

Although neural mobilization and gluteal strengthening have demonstrated benefits individually, limited high-quality evidence exists regarding their combined effectiveness in unilateral sciatica.[33] Additionally, few studies have explored the clinical application of crosseducation in pain-related neurological conditions such as sciatica.[34] Middle-aged adults, despite representing a high-risk group, are often underrepresented in age-specific analyses.[35] Therefore, the present study was undertaken to investigate whether adding contralateral gluteus medius strengthening to a standard sciatic nerve flossing program results in superior improvements in pain, disability, and functional outcomes compared to nerve flossing alone in middle-aged adults with unilateral sciatica.[36] It is hypothesized that the combined intervention will provide greater reductions in pain and disability, improve functional activities, and enhance hip abductor performance through cross-education mechanisms.[37]

METHODOLOGY

A Randomized Control Trail Experimental Study was conducted on middle-aged adults with unilateral sciatica in various regions and areas of Kolhapur. The Probability sampling design Simple Random Sampling is used. The study was conducted for a duration of 6 months. Approval from Institutional Ethical Committee was taken.

Written consent was taken from the participant willing to participate. Participants were selected on the basis of inclusion and exclusion criteria. They were assessed using Numerical Pain Rating Scale (NPRS), Sciatica Bothersomeness Index (SBI) and Modified aneroid sphygmomanometer (MST) Participants was divided into 2 groups where **GROUP A** received Sciatic Nerve Flossing alone for 4 weeks (5 times a week and 3 times a day). The **patient position was** slump sitting on an edge of chair /plinth. Then Sciatic Nerve Flossing Technique Procedure was performed. The participant flexed the knee of the target lower extremity backwards beside the chair, as far back as possible and flexed the neck at the same time, holding both the flexed knee and neck in this position for 5 seconds. The participant in turn extended the neck and the knee of the target lower extremity, abducted and flexed the hip until pain was felt and did not push beyond that point. This extended position was equally maintained for 5 seconds. The procedure (Nerve Flossing Technique) was repeated 15 times, for 3 sets with an interval of 5 minutes between each set. However, it was observed that as the nerve became less sensitive, the participant increased the stretching effect by dorsiflexing the ankle and extending the toes of the foot upward towards the shin.[20]

GROUP B received Sciatic Nerve Flossing (ipsilateral) in addition to Contralateral Gluteus Medius Strengthening where s**ciatic Nerve Flossing technique procedure along with Contralateral** Gluteus Medius Strengthening **was given same** as group A (Slump sitting sliders) **with a session extending** 4 weeks (5 times a week and 3 times a day). **Patient position was** slump sitting on an edge of chair /plinth. Contralateral Gluteus Medius Strengthening Exercises were given as follows:

Lateral step up
Clamshell exercise
Single Leg Stance
Side lying hip abduction
Single Leg Bridge

Lateral step up –

Patient position: The patient should stand lateral (sideways) to a platform or step. **Method:** Firmly plant the contralateral foot on the step. Until the leg is fully extended, drive upward via the heel of the raised foot. When going back to the starting position, the afflicted leg should dangle loosely or be utilized solely for light balance. With a focus on eccentric control of the contralateral gluteus medius, progressively lower yourself back down. Ten repetitions are required. Three sets. Frequency: five days a week, 3 sessions per day.[41]

Clamshell exercise

Patient position: Side-lying on the side that is affected (the side that needs strengthening is on top). The knees should be 90° flexed and the hips about 45° flexed. The heels and the spine ought to line up. The bottom arm supports the head. **Method:** The patient externally rotates the hip to raise the upper (contralateral) knee toward the ceiling while maintaining foot contact. It is crucial to make sure that the movement originates solely from the hip joint and does not cause the pelvis to rotate backward. Return the knee to the beginning position gradually. Hold: 10 seconds (when the contraction is at its peak). Ten repetitions are required. Three sets.[39] **Single leg stance**

Patient position: The patient should stand up on a level surface. The patient should wear stable athletic shoes or be barefoot.

Method: Transfer weight to the unaffected, contralateral leg. Flex the hip and knee to raise the afflicted leg a little off the ground. Prevent the hip from "dropping" on the side that is not bearing weight by keeping the spine neutral and the pelvis level. Hold for 30 seconds. Five repetitions. Frequency: 5 days a week, 3 sessions per day. [41]

Side-lying hip abduction

Patient position: The patient should lie sideways on the side that is affected (with the side that is being strengthened on top). For stability, the lower leg may be somewhat flexed. For neutral cervical position, the head should be supported by the arm or a cushion.

Method: Maintain the upper (contralateral) leg straight and slightly bent behind the body's midline (hip extension). Make sure the pelvis does not move rearward as you abduct the leg toward the ceiling (around 30 to 45°). Pay attention to the lateral hip contraction. Ten repetitions are required. Three sets. 3 sessions a day, five days a week, is the frequency.[39]

Single leg bridge

Patient position: Supine (laying on the back), foot flat on the floor, and contralateral (unaffected) knee flexed.

Method: (The "Up" Leg) the leg that is afflicted- the one that has sciatic pain- is raised off the ground.

It must not come into contact with the ground or aid in the lift, however it can be kept straight out or with the knee slightly bent. Procedure: To raise the hips, the patient drives through the heel of the unaffected leg. The entire pelvis must be stabilized against gravity by the unmodified gluteus medius and maximus. Hold for ten seconds. Ten repetitions are required with three sets.[39]

RESULTS:

A total 70 subjects diagnosed with unilateral sciatica who meet the inclusion criteria were selected for the study. There were two groups, each with 35 individuals, such as Group A and Group B .Age of patients were from 40 to 60 years with mean of age in both groups is 49.99 (± 6.34)

Paired t-test was used for within-group comparisons before and after training and Unpaired t-test for comparisons between Group A and Group B. The study included 70 participants diagnosed with unilateral sciatica who meet the inclusion criteria consisting of 43 females (61.40%) and 27 males (38.60%).

Parameters	**Assessment Period**	**Mean**	**Std. Deviation**	**p-value**
NPRS AT REST	Pre	2.51	1.25	<0.001*
	Post	1.77	0.94	
NPRS AT ACTIVITY	Pre	6.06	1.51	<0.001*
	Post	4.97	1.45	
SBI	Pre	21.71	5.37	<0.001*
	Post	19.97	5.27	
MST	Pre	49.57	6.47	<0.001*
	Post	50.29	6.46	

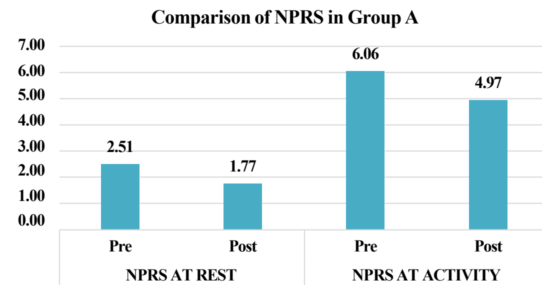
Table No.3 Parameters for group A

The mean NPRS score (at rest) dropped from 2.51 ± 1.25 at baseline pre-treatment to 1.77 ± 0.94 post-treatment. A statistically significant decrease in pain was seen (p <0.001)

The mean NPRS score (at activity) dropped from 6.06 ± 1.51 at baseline pre-treatment to 4.97 ± 1.45 post-treatment. A statistically significant decrease in pain was seen (p <0.001)

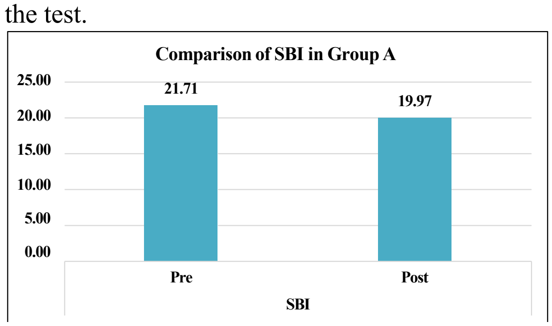
The mean SBI score dropped from 21.71 ± 5.37 pre-treatment to 19.97 ± 5.27 post-treatment, indicating that after the intervention, participants had less sciatic pain and difficulties with movement. Statistically, this improvement was highly significant (p <0.001)

The mean MST score showed a significant improvement in G medius muscle strength, increasing from 49.57 ± 6.47 pre-treatment to 50.29 ± 6.46 post-treatment. This improvement was statistically significant (p <0.001), suggesting that participant's strength and mobility was increased.



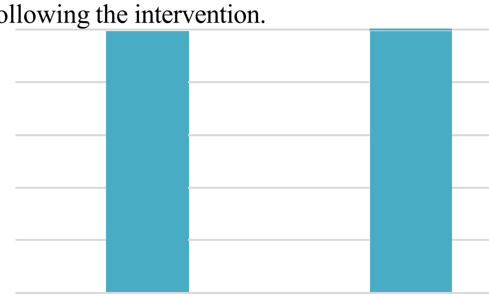
Graph No. 2 Comparison of Numeric Pain Rating Scale (NPRS) in Group A

The Numeric Pain Rating Scale (NPRS), which measures pain severity, demonstrated a discernible decrease from 2.51 (pre-intervention) to 1.77 (post-intervention) at rest & from 6.06 (pre-intervention) to 4.97 (post-intervention) at activity. The intervention were successful in reducing sciatic pain at rest and at activity, since participants initial reports of moderate to severe pain decreased after the test.



Graph No.3 Comparison of Sciatica Bothersomeness Index (SBI) in Group A

The sciatic pain and severity of symptoms, assessed using the (SBI) Sciatica Bothersomeness Index, showed reduction from 21.71 (pre-intervention) to 19.97 (post-intervention). This decrease indicates a notable improvement of sciatic discomfort and functional impairment, suggesting improved capacity of lower limb to carry out daily tasks following the intervention.



Graph No.4 Comparison of Modified Aneroid Sphygmomanometer (MST) in Group A

Effectiveness of gluteus medius, measured by the Modified Aneroid Sphygmomanometer (MST), showed a substantial improvement from 49.57 (pre-intervention) to 50.29 (postintervention). A higher MST score indicates improved G medius strength and mobility.

Group B Analysis (Paired t-test)

The Scale evaluates the before and after changes in the parameters for Group B

Parameters	Assessment Period	Mean	Std. Deviation	p-value
NPRS AT REST	Pre	2.51	1.25	<0.001*
	Post	0.89	0.76	
NPRS AT ACTIVITY	Pre	6.91	1.31	<0.001*
	Post	3.37	0.88	
SBI	Pre	22.37	3.87	<0.001*
	Post	12.91	3.28	
MST	Pre	49.11	8.26	<0.001*
	Post	66.63	8.72	

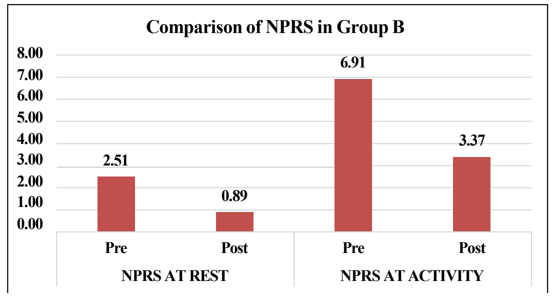
Table No.4 Parameters for group B

The mean NPRS score (at rest) dropped from 2.51 ± 1.25 at baseline pre-treatment to 0.89 ± 0.76 post-treatment. A statistically significant decrease in pain was seen (p <0.001)

The mean NPRS score (at activity) dropped from 6.91 ± 1.31 at baseline pre-treatment to 3.37 ± 0.88 post-treatment. A statistically significant decrease in pain was seen (p <0.001)

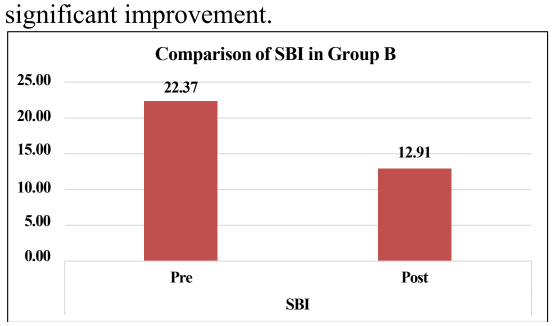
The mean SBI score dropped from 22.37 ± 3.87 pre-treatment to 12.91 ± 3.28 post-treatment, indicating that after the intervention, participants had less sciatic pain and difficulties with movement. Statistically, this improvement was highly significant (p <0.001)

The mean MST score showed a significant improvement in G medius muscle strength, increasing from 49.11 ± 8.26 pre-treatment to 66.63 ± 8.72 post-treatment. This improvement was statistically significant (p <0.001), suggesting that participant's strength and mobility was increased.



Graph No. 5 Comparison of Numeric Pain Rating Scale (NPRS) in Group B

The Numeric Pain Rating Scale (NPRS), for Group B pre & post intervention for at rest and at activity are compared in the graph above. Participants reported high levels of pain at baseline, as shown by the mean pre-intervention NPRS score at rest of 2.51. The mean NPRS score at rest decreased to 0.89 post-intervention, indicating a significant reduction in the severity of the pain at rest as well as the mean pre-intervention NPRS score at activity of 6.91 .The mean NPRS score at activity decreased to 3.37 post-intervention, indicating a significant reduction in the severity of the pain at activity. This significant decrease implies that Group B's discomfort was successfully reduced by intervention. As pain levels changed from severe to mild on the NPRS scale, the difference between pre & post treatment scores shows a clinically significant improvement.



Graph No. 6 Comparison of Sciatica Bothersomeness Index (SBI) in Group B

The Sciatica Bothersomeness Index (SBI) scores for Group B pre & post intervention are shown in the above graph. There was more sciatic discomfort and functional impairment, at baseline, as indicated by the mean pre-intervention SBI score of 22.37. The mean SBI score dropped to 12.91 post intervention. The results show that Group B's treatment protocol greatly increased functional capacity and decreased sciatic pain, both of which improved the participants' quality of life.

Graph No. 7 Comparison of Modified Aneroid Sphygmomanometer (MST) in Group B

The Modified Aneroid Sphygmomanometer (MST) values in Group B are shown in the above graph both before and after the intervention. Reduced G medius strength and overall performance at baseline were indicated by the mean pre-intervention MST score of 49.11. The mean MST score significantly rise to 66.63 post intervention. The results show that intervention given to Group B significantly enhanced lower limb function and restore muscle strength. The significant improvement in MST scores demonstrates the treatment protocol's beneficial effects.

Group A v/s Group B (Unpaired t- test)

The post-intervention comparison of outcome measures, such as NPRS, SBI, and MST between Group A and Group B is shown in the table.

Parameters	Group	Mean	Std. Deviation	p-value
NPRS AT REST	A	1.77	0.94	<0.001*
	B	0.89	0.76	
NPRS AT ACTIVITY	A	4.97	1.45	<0.001*
	B	3.37	0.88	
SBI	A	19.97	5.27	<0.001*
	B	12.91	3.28	
MST	A	50.29	6.46	<0.001*
	B	66.63	8.72	

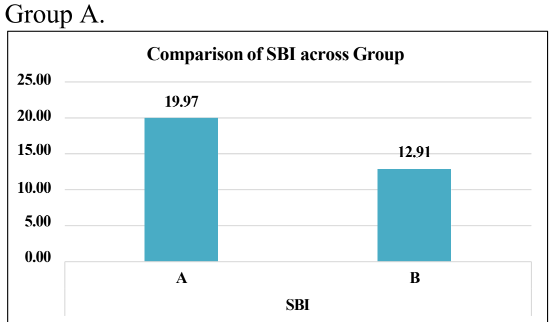
Table No.5 Comparison for group A v/s group B

Group A had mean score of 1.77 ± 0.94 at rest on the Numeric Pain Rating Scale (NPRS), while Group B had a reduced mean score at rest of 0.89 ± 0.76. Also Group A had mean score of 4.97 ± 1.45 at activity on the Numeric Pain Rating Scale (NPRS), while Group B had a reduced mean score at activity of 3.37 ± 0.88. This findings imply that Group B experienced more pain reduction than Group A, since lower NPRS scores indicates less pain. There was a statistically significant difference (p <0.001) between the groups.

Group B had a lower mean score of 12.91 ± 3.28 on the Sciatica Bothersomeness Index (SBI), whereas Group A had a mean score of 19.97 ± 5.27. Group B showed higher functional improvement & lesser discomfort then Group A because lower SBI ratings indicates less pain and impairments. Additionally, this difference was statistically significant (p <0.001) Group B had a significantly higher mean score 66.63 ± 8.72 than Group A 50.29 ± 6.46 on the Modified Aneroid Sphygmomanometer (MST), where higher scores indicate betterment in muscle strength. This suggests that Group B experienced more improvement. There was a statistically significant difference (p <0.001) between the groups.

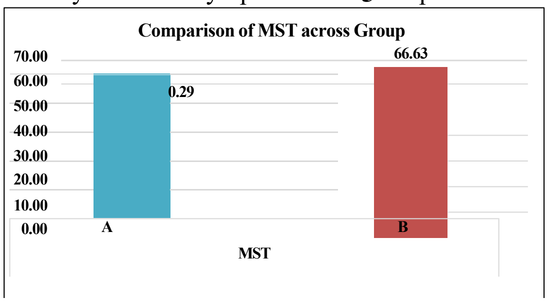
Graph No. 8 Comparison of Numeric Pain Rating Scale (NPRS) across Group A and Group B

The mean Numeric Pain Rating Scale (NPRS) scores at rest & at activity for Group A and Group B are compared in the graph. The NPRS is frequently used to measure pain intensity, with higher scores denoting higher degrees of discomfort. The graph indicates that Group B had a lower mean NPRS score of 0.89 at rest & 3.37 at activity, whereas Group A reported a mean score of 1.77 at rest & 4.97 at activity. This indicates that participants in Group B experienced less pain compared to those in Group A. The difference between the two groups raises the possibility that Group B's treatment was more successful in lowering pain levels. Since a decrease of one point or more on the NPRS scale is sometimes seen as significant clinical settings, the observed difference at rest is (about 0.88 points) & at activity (about 1.6 points) might be a pertinent improvement. Overall the results indicate that the potential efficacy of the intervention performed in Group B by showing that Group B experienced better pain outcomes than Group A.



Graph No. 9 Comparison of Sciatica Bothersomeness Index (SBI) across Group A and Group B

A comparison of Group A & Group's SBI (Sciatica Bother someness Index) scores is shown in the above graph. SBI is a commonly used tool to measure pain & severity of sciatic symptoms, higher scores indicate more pain & disability. The graph indicates that Group A had a mean SBI score of 19.97, but Group B had a lower mean score of 12.91. This suggests that compared to those in Group A, participants in Group B had experienced comparatively less sciatic pain and functional impairments. The intervention given to Group B may have been more successful in lowering sciatic pain and impairment, according to the differences between the groups. Even slight decrease in SBI scores can indicate significant gains in day-to-day activities and functional performance. Overall, the results indicates that the potential efficacy of the intervention performed in Group B, by showing that Group B experienced better reduction in pain and severity of sciatic symptoms than Group A.



Graph No. 10 Comparison of Modified Aneroid Sphygmomanometer (MST) across Group A and Group B

A graph shows a comparison of the mean MST scores for Group A & Group B. The MST is commonly used to evaluate muscle strength (i.e. G medius). Higher MST scores indicate better strength and improvement. According to the graph, mean MST score for Group B was higher 66.63 than Group A, which was 50.29. This implies that individuals in Group B exhibited superior strength in contrast to those in Group A. The results demonstrate the possible efficacy of the intervention given to Group B, as seen by their higher MST scores. According to these findings, the total functional recovery (muscle strength) of Group B was superior than Group A.

DISCUSSION

The present study was conducted to investigate the combined effect of contralateral gluteus medius strengthening as an adjunct to sciatic nerve flossing in middle-aged adults with unilateral sciatica. Unilateral sciatica, characterized by pain radiating along the sciatic nerve pathway, remains a common cause of disability in middleaged adults. The annual incidence ranges from 1%–5%, while lifetime incidence is estimated between 10%–40%.

Because sciatica significantly affects pain, functional ability, and quality of life, effective conservative physiotherapy management remains important. This study compared two interventions: sciatic nerve flossing alone (Group A) and sciatic nerve flossing combined with contralateral gluteus medius strengthening (Group B). Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), symptom severity using the Sciatica Bothersomeness Index (SBI), and muscle strength using the Modified Aneroid Sphygmomanometer Test (MST).

The findings demonstrated improvement in both groups after intervention; however, Group B showed significantly greater improvement in pain reduction, symptom severity, and muscle strength compared to Group

A. These results suggest that combining sciatic nerve flossing with contralateral gluteus medius strengthening is more effective than sciatic nerve flossing alone.

Sciatic nerve flossing, also known as neural mobilization or neurodynamic technique, is widely used to restore normal mobility and flexibility of neural tissues. In sciatica, nerve root irritation or compression can lead to increased mechanosensitivity, intraneural oedema, and reduced nerve mobility. Neural mobilization uses rhythmic movements to alternately tension and relax the nerve, thereby improving neural circulation, reducing adhesions, and enhancing axoplasmic flow. Previous studies have shown that neural mobilization decreases pain and improves functional mobility in lumbar radiculopathy and sciatica. Consistent with these findings, Group A in the present study demonstrated significant reductions in pain and sciatica bothersomeness following sciatic nerve flossing. However, neural mobilization alone may not sufficiently address underlying muscular imbalance and altered lumbopelvic biomechanics contributing to sciatic symptoms.

The gluteus medius plays a vital role in pelvic stabilization during weight-bearing activities such as walking and standing. Weakness of this muscle may lead to pelvic instability, altered gait mechanics, and increased stress on the lumbar spine and sciatic nerve. Previous studies have reported reduced gluteus medius strength and activation in individuals with low back pain and sciatica. Strengthening the contralateral gluteus medius helps improve pelvic alignment, lumbopelvic stability, and load distribution, thereby reducing stress on the affected side and minimizing sciatic nerve irritation. Improved pelvic control may also reduce abnormal movement patterns associated with pain. This method makes use of the cross-education concept, which states that exercising the unaffected limb improves neural drive and stabilizes the problematic side without causing sciatic nerve irritation. According to Glaviano et al. and Distefano et al., each treatment is made to maximize muscle recruitment by combining open and closed-chain movements. In order to allow for neuromuscular adaptation and enhanced lumbopelvic control, the workouts are done over a 4-week period. Goal is to lessen compensatory pelvic tilting and mechanical stress on the injured sciatic nerve by strengthening the good side.

Participants in Group B, who received both sciatic nerve flossing and contralateral gluteus medius strengthening, demonstrated significantly greater reductions in pain intensity and symptom severity compared to Group A. The combined intervention likely produced a synergistic effect, where nerve flossing improved neural mobility and reduced mechanosensitivity, while gluteus medius strengthening enhanced pelvic stability and decreased mechanical stress on neural tissues. Group B also showed greater improvement in SBI scores, indicating reduced severity of symptoms such as leg pain, numbness, weakness, and discomfort.

Another important finding was the significant improvement in muscle strength measured using the Modified Aneroid Sphygmomanometer. Group B showed greater strength gains, suggesting that gluteus medius strengthening effectively enhanced muscular performance and pelvic stability. Previous studies by Distefano et al. and Glaviano et al. similarly highlighted the role of gluteus medius strengthening in improving hip stability, neuromuscular control, and reducing lumbar stress during movement.

The concept of regional interdependence may further explain the superior outcomes in Group B. Dysfunction or weakness in the contralateral gluteus medius can alter pelvic alignment and spinal mechanics, thereby increasing stress on the affected side in unilateral sciatica. Strengthening the contralateral gluteus medius may therefore improve lumbopelvic balance, reduce compensatory movements, and decrease nociceptive input from surrounding tissues through enhanced proprioception and neuromuscular control.

Thus, the findings of the present study support the use of a multimodal rehabilitation approach addressing both neural and muscular components in unilateral sciatica. Sciatic nerve flossing improves neural mobility and reduces mechanosensitivity, while contralateral gluteus medius strengthening enhances pelvic stability, muscle strength, and neuromuscular control. The combined intervention proved more effective than sciatic nerve flossing alone in reducing pain, decreasing sciatica-related symptoms, and improving muscle strength. These results highlight the importance of integrating neural mobilization with targeted muscle strengthening in physiotherapy management of unilateral sciatica to achieve better clinical and functional outcomes.

CONCLUSION

The results of this study indicate that although sciatic nerve flossing is useful in increasing neural mobility and decreasing sciatica-related pain, contralateral gluteus medius strengthening offers additional advantages by enhancing neuromuscular control, improving pelvic stability, and lowering mechanical stress on the sciatic nerve. For the treatment of unilateral sciatica, the combined intervention thus provides a more thorough rehabilitation strategy.Therefore, in middle-aged adults with unilateral sciatica, contralateral gluteus medius strengthening in addition to sciatic nerve flossing is more effective than sciatic nerve flossing alone in lowering pain, lessening the intensity of sciatica symptoms, and increasing muscle strength.

REFERENCES

1. Pradhan A, JM, et.al. Effects of neurodynamics along with conventional exercises on sciatica patients: a single-blinded randomized clinical trial. Cureus. 2024 May 6; 16(5):e59722. doi: 10.7759/cureus.59722.
2. Peacock M, Douglas S, et.al. Neural mobilization in low back and radicular pain: a systematic review. J Man Manip Ther. 2023 Feb; 31(1):4-12. doi: 10.1080/10669817.2022.2065599.
3. Sarkari E, Multani NK, et.al. Efficacy of neural mobilisation in sciatica. J Exerc Sci Physiother. 2007; 3(2):136-141.
4. Neto T, Almazán-Polo J, et al. Peripheral and central changes induced by neural mobilization in animal models of neuropathic pain: a systematic review. Front Neurol. 2024 Jan 5;14:1289361. doi: 10.3389/fneur.2023.1289361
5. Pizol GZ, Miyamoto GC, et.al. Hip biomechanics in patients with low back pain, what do we know? A systematic review. BMC Musculoskeletal Disorder. 2024 May 24; 25(1):415. doi: 10.1186/s12891-024-07463-5.
6. Ellis RF, Hing WA, et.al. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008; 16(1):8-22. doi: 10.1179/106698108790818594.
7. Chen Q, Wang Z, et.al. Efficacy of neuromobilization in the treatment of low back pain: systematic review and meta-analysis. PLoS One. 2024 May 1; 19(5):e0302930. doi: 10.1371/journal.pone.0302930.
8. Almeer G, Azzopardi C C, et.al. Gluteus medius muscle pathologies - A case series & pictorial review. J Orthop. 2020 Mar 28.
9. Sadler S, Cassidy S, et.al. Gluteus medius muscle function in people with and without low back pain: a systematic review. BMC Musculoskeletal Disorder. 2019 Oct 22; 20(1):463. doi: 10.1186/s12891-019-2833-4.
10. Stastny P, Tufano JJ, et.al.

Strengthening the gluteus medius using various bodyweight and resistance exercises. Strength Cond J. 2016 June.

11. Lee M, Carroll TJ, et.al. Cross education: possible mechanisms for the contralateral effects of unilateral resistance training. Sports Med. 2007

12. Manca A, Dragone D, Dvir Z, Deriu F. Cross-education of muscular strength following unilateral resistance training: a meta-analysis. Eur J Appl Physiol. 2017.

13. Green LA, Gabriel DA, et.al. The cross education of strength and skill following unilateral strength training in the upper and lower limbs. J Neurophysiol. 2018

14. Peacock M, Douglas S, et.al. Neural mobilization in low back and radicular pain: a systematic review. J Man Manip Ther. 2023 Feb.

15. Gottschalk F, Kourosh S, et.al. The functional anatomy of tensor fasciae latae and gluteus medius and minimus. J Anat. 1989

16. Lee M, Gandevia SC, et.al. Unilateral strength training increases voluntary activation of the opposite untrained limb. Clin Neurophysiology. 2009 April.

17. Rosario J L. Understanding Muscular Chains – A Review for Clinical Application of Chain Stretching Exercises Aimed to Correct Posture [Internet]. EC Orthopaedics. 2017 Apr 10.Lv S, Li S, Zhang J, Wang Y, et al. Progress of Muscle Chain Theory in Shoulder Pain Rehabilitation: Potential Ideas for Pulmonary Rehabilitation. Evid Based Complement Alternat Med. *2022*.

18. Almansoof HS, Muaidi QI, Al-Marzouki S, et al. Role of kinetic chain in sports performance and injury risk: a narrative review. *J Med Life*. 2023 Nov.

19. Bewyer DC, Cooper NA, Abbott A, McGregor AH. Prevalence of gluteus medius weakness in people with chronic low back pain compared to healthy controls. Eur Spine J. 2016 Apr; 25.

20. Archana Verma, Ishwar Lal Patidar, et.al. Effectiveness of gluteal muscle strengthening exercises on non-specific low back pain in early adulthood population. 2014

21. Ellis RF, Hing WA, et.al. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. J Man Manip Ther. 2008;16

22. George SZ, Fritz JM, et.al. Interventions for the Management of Acute and Chronic Low Back Pain: Revision 2021. J Orthop Sports Phys Ther. 2021 Nov.

23. Lecce E, Conti A, et.al. Cross-education: motor unit adaptations mediate the strength increase in non-trained muscles following 8 weeks of unilateral resistance training. Front Physiol. 2025; 15.

24. Kääriä S, Leino-Arjas P, Rahkonen O, Lahti J, Lahelma E, Laaksonen M. Risk factors of sciatic pain: a prospective study among middle-aged employees. *Eur J Pain*. 2011; 15.

25. Pellicciari L, Paci M, Geri T, Piscitelli D, Baccini M. Mobilization of the contralateral limb in Slump position: effects on knee extension in healthy adult subjects. Acta Biomed. 2019 Sep 6

26. Onsy HM, AbdElmaged SF, El-Azizi HM, Ibrahim MM. Effect of gluteus medius strengthening on pain, function, and muscle macromorphology in nonspecific chronic low back pain: randomized controlled trial. Muscles Ligaments Tendons J. 2024;14