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EFFECTS OF NEURAL GLIDES VERSUS PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION IN TERMS OF JOINT POSITION SENSE AND PAIN IN CERVICAL RADICULOPATHY

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ABSTRACT

Among common neurological disorders one of the most commonly seen disorder is cervical radiculopathy. It is generally seen among different population. The aim of this study was to compare the effectiveness of neural glides versus on joint position sense, pain for individuals with cervical radiculopathy. This is a quasi-experimental study in which a sample of twenty eight symptomatic participants of cervical radiculopathy with forward head posture allocated into the 2 groups by convenient sampling technique. Group A received median nerve glide and Group B received rhythmic stabilization technique. The outcome measure tools were cranio vertebral angel, Joint position sense, Numeric pain rating scale and Neck Disability Index for CVA, proprioception, pain and neck disability respectively. Data was analyzed with SPSS version 21. Group B had significant improvements in joint position sense compared to Group A ($p < 0.05$) via rhythmic stabilization, while median nerve glide did not show significance ($p > 0.05$). Numeric pain rating scale differences were not significant ($p > 0.05$), indicating no correlation with treatment groups. Group B demonstrated more significant improvement in craniovertebral angle (CVA) compared to Group A ($p < 0.05$). Neck disability index (NDI) showed a significant correlation between both groups ($p < 0.05$), with Group B showing greater improvement. Current study concluded that Proprioceptive neuromuscular facilitation is more effective for joint position sense, cranio-vertebral angle, and neck disability than median nerve glide.

Key words: Joint position sense (JPS), Cranio-vertebral angle, cervical radiculopathy, PNF (proprioception neuromuscular technique)

INTRODUCTION

Cervical radiculopathy (CR) is a neurological condition caused by the compression of cervical spinal nerve roots, primarily at C6 and C7 levels. It leads to pain and numbness in the upper extremities, often due to narrowing of the neural foramina in the cervical spine, attributed to factors like degenerative changes, disc herniation, and spondylosis (1).

A cranio-vertebral angle below 49 degrees indicates forward head posture (FHP). Proprioceptive deficits, such as impaired joint position sense (JPS), contribute to neuromuscular control impairment, leading to functional instability and repetitive injuries. Improving JPS is essential for accident prevention and restoring function in sports rehabilitation and musculoskeletal physiotherapy (2). Literature shows that PNF increased activities of cerebellum and superior parietal cortex because both of these are responsible for JPS (3).Some studies found that there are possibilities of the effect of PNF technique on JPS gives different results according to physical problem, body region and different techniques of PNF (4). Rhythmic stabilization (RS) effectively enhances strength, flexibility, and muscle coordination by targeting stronger muscles to stabilize weaker ones. It includes a relaxation period to alleviate pain (5). Cervical radiculopathy symptoms are categorized by the affected nerve level. Since cervical spine nerves control neck and arm muscles, radiculopathy often leads to tingling in the arms. Patients commonly report hypersensitivity to light touch in the affected area and weakness in muscles supplied by the involved nerves (6). PNF associated with stretching, resisted development, traction and estimate to enhance muscle decay, disharmony, joint development impediment and atrophy. It is powerful in improving adaptability, quality and scope of motion. Subsequently, it diminishes torment and wants to improve the quality of muscles (7).

Post-isometric relaxation technique (PIR) is commonly used for joint dysfunction and muscle tension in myofascial pain syndromes, but its effectiveness for cervical radiculopathy is rarely studied. Rhythmic stabilization, a PNF technique, involves alternating isometric contractions to improve range of motion, strength, stability, balance, and reduce pain (8). Joint position sense (JPS) is most commonly used measure of assessing proprioception. Cervical JPS has colossal effect on postural awareness whole body balance and eventually on gait control study shows that non traumatic neck pain patients had increased error in repositioning the head and neck in neutral position (9). Common symptoms of cervical radiculopathy include occipital headache, inter scapular pain, and neck pain worsened by vertebral motion. Unilateral arm pain, tingling in the thumb (for C6 involvement) or middle finger (for C7 involvement), and difficulty with gripping objects are also reported (10). Neural glides are treatment utilized for reestablishing the homeostasis of the sensory system, by assembling the structures around it or sensory system itself. Point of neurodynamics is to re-establish mechanics of nerves and anxious system (11).

In the recent study use of deep flexors exercise and PNF techniques on neck pain to alleviate the joint position error (12). Neural mobilizations and the PNF technique is better to decrease pain, and improve function in subjects with cervical radiculopathy (8). This study includes neural mobilizations and the PNF technique to assess their effectiveness in treating cervical radiculopathy, specifically focusing on joint position sense. Neurodynamics are crucial as they enhance nerve mobility, potentially reducing symptoms. Meanwhile, the PNF technique, being a newer approach for cervical radiculopathy, is evaluated to determine which treatment option is more efficient for improving proprioception in these patients (13).

METHODS

This study is Quasi-Experimental Trial. The study was conducted in the Madina Teaching Hospital, Faisalabad and Kadijatulkubra hospital, Chiniot. The study was completed within the time duration of 6 months after the approval of ethical committee of Riphah College of Rehabilitation Sciences. Sample size was 28. Sample size of both groups were 14. Convenient sampling technique was used

to collect the data. Data collection tools were Neck disability index (NDI), Numeric pain rating scale (NPRS), Craniovertebral angel (CVA) and Lesser headlight method for JP. During first visit the consent form and screening form was filled; Thirty two patients with radiculopathy age ranging 25-45 years were included in the study. The craniovertebral angle, indicating forward head posture, was set at less than 49 degrees for both groups.

A digital video camera (Sony 16.1 M pixels) was positioned at shoulder height to capture the angle between a horizontal line through C7 and a line from the tragus of the ear to C7. Measurements were taken before and after treatment sessions (14). Intervention was applied for 4 weeks, 3 sessions per week. Treatment was given to the allocated groups.

2.1 Hot Pack:
Moist hot pack was applied for 20 mints.

2.2 Manual cervical traction:
For manual cervical traction, the patient lies supine while the therapist stands at the head of the patient. The therapist gently holds the back of the patient's neck with one hand near the base of the skull and cups the other hand under the patient's chin. Slow, gradual traction force is applied by the therapist leaning back, maintained for 1 minute, followed by a 30-second rest period. This cycle is repeated for a total of 6 repetitions, completed within approximately 10 minutes (15).

2.3 Nerve glide of median nerve:
Group A received neural mobilization of the median nerve, with the therapist standing on the affected side. The patient's shoulder was depressed with one hand, while the therapist flexed the elbow to 90 degrees, supinated the forearm, and extended the wrist and fingers with the other hand. The patient's arm was then abducted to 90 degrees, and sliding or gliding of the nerve was applied. This was performed for six sets of 60 seconds each, on alternate days for 4 weeks, with progression to gliding/tensioning if symptoms improved (15).

2.4 PNF (Rhythmic stabilization technique):
Group B underwent PNF Rhythmic stabilization technique during each session. The patient, lying supine, resisted isometric muscle contractions facilitated by the therapist. Sessions aimed to improve neck stability, coordination, and posture, with 12-15 repetitions of 10-second contractions and 30-second rests between sets (16).

2.5 Joint position error:
Joint position sense (JPS) was measured using the Joint Position Error (JPE) method. Participants sat in a chair with a custom-made hat equipped with a laser pointer. They were instructed to perform head movements with eyes open and closed, aiming to return to the starting position. The average of three repetitions was used to analyze JPS error, measured in centimeters as the difference between starting and joint positions (17).

Outcomes
A questionnaire containing basic demographic information.
- Neck disability index (NDI)
- Numeric pain rating scale (NPRS) • Craniovertebral angel (CVA).
- Lesser headlight method for JPE.

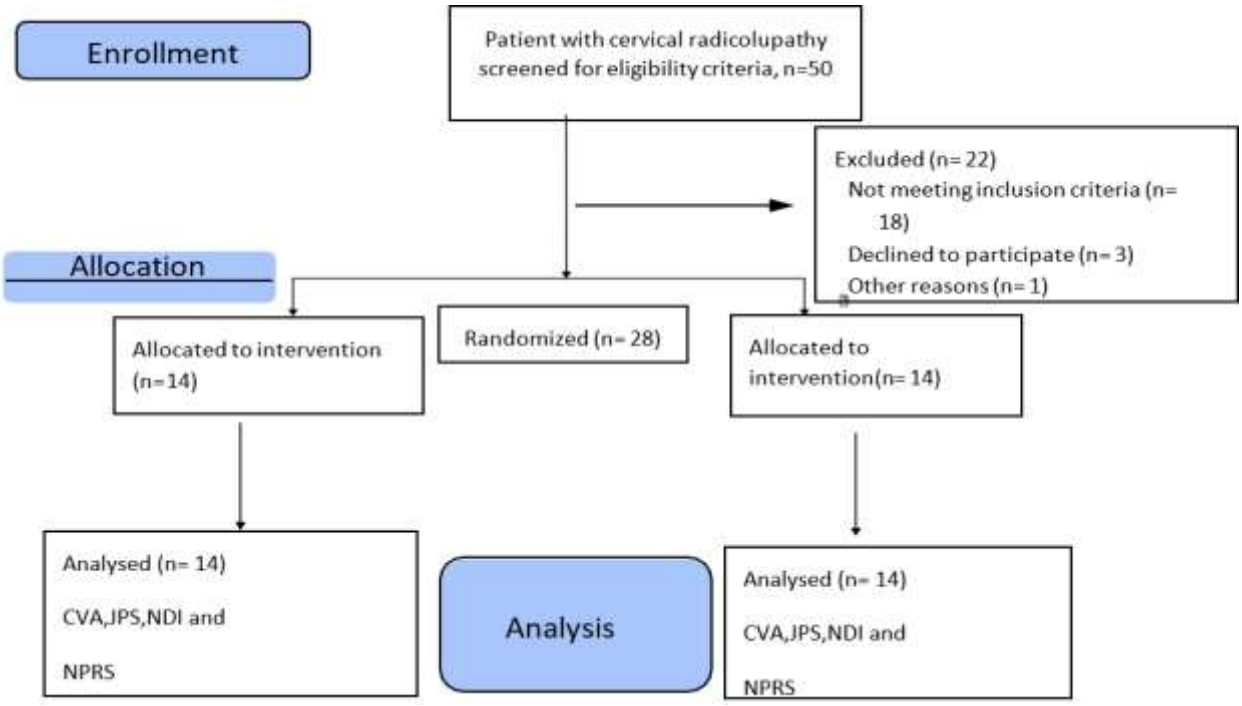

FIG 1. Study Flow Chart.

Statistical Analysis

The primary analysis was to evaluate the effects of neural glides versus Proprioceptive Neuromuscular Facilitation in terms of joint position sense and pain in cervical radiculopathy. Statistical significance was set at P=0.05. Following tests was used Data was normally distributed. Data was checked using Shapiro wilk Test and P value was >0.05. Descriptive Statistics: Frequency tables, pie charts, bar charts were used to show basic demographics and descriptive. Changes between pre and post treatment: Paired sample-t test was used to show the progress of two groups between pre and post treatment session. Difference between Groups: Independent sample t test was be used to show the progress of two groups between in terms of subjective and objective measurements. This is parametric test.

Ethics

Ethics approvals were obtained from Riphah International university Islamabad under Ref. no. RCR&AHS/REC/RCRS/19/2031.

RESULTS

The results of descriptive statistics shows that 28 patients were included in the study with agegroup of 25-45 years with mean and SD of both groups was 34.18±5.982.The mean BMI of group A is 25.95±5.9 and group B is 30.14±6.2.There was no significant difference seen after analysis of baseline measures means of two groups with p>0.05.Thus both groups were comparable at baseline. In group A there were 4 male and 10 females and in group B there were 5 males and 9 females. 28.6 percent of the participants were male and 71.4 percent werefemale in group A. 35.7 percent of the participants were male and 64.3 percent were female in group B. Mean± SD of age was (34.35±5.97). Significant increases in Cranio Vertebral Angle (CVA) post-treatment were found in both Group A (46.03±2.41 to 47.50±2.13) and Group B (44.42±3.49 to 52.71±3.66), with $P < 0.05$, indicating statistical significance and suggesting positive effects of PNF on cervical rehabilitation in both groups. Participants treated with neural gliding showed a significant decrease in NDI scores from 50.29±9.21 before treatment to 17.83±6.82 after ($p < 0.05$). Similarly, those treated with Rhythmic Stabilization decreased from 59.07±12.04 to 25.79±10.46 ($p < 0.05$), indicating significant improvements in NDI scores post-treatment, highlighting the effectiveness of PNF

interventions in reducing neck disability. Participants treated with median nerve glide and in Group B showed significant decreases in NPRS scores post-treatment ($p < 0.05$), indicating effective reduction in pain intensity with PNF interventions. The table shows significant improvement in reducing joint position error (JPE) with PNF (rhythmic stabilization) in Group B ($p < 0.05$), compared to Neurodynamics (Median nerve glide) in Group A ($p > 0.05$). This suggests PNF (rhythmic stabilization) is more beneficial for improving.

The mean and SD of NDI in group A after treatment is 17.83±6.825 and group B mean± S.D 25.79±10.46.The value of P showing (P value >0.05) between both treatment groups, so thereis no any statistical significant difference between treatment groups. Mean± SD of CVA after four weeks of treatment as Rhythmic stabilization is (52.71±3.6) and after median nerve glide is (47.50±32.1), which shows that treatment given the group B is more beneficial for CVA improvement. It is also seen that the CVA after taking treatment with both the interventional strategies has ($p<0.05$) which shows that there have been significant improvement in both groups. Mean°±S.D° for the NPRS being measured in group A after treatment is 3.07±.730 and groupB is 3.00±.679 which shows the both groups have positive decrease in the values of pain. Value of $p<0.05$ which shows there is significant decrease in the NPRS after getting the treatment. The positive improvement shows the results are significant.

TABLE 1. Gender group A

Gender	Frequency	Percent
Female	10	71.4
Male	4	28.6
Total	14	100.0

The above table shows that 28.6 percent of the participants were male and 71.4 percent were female in group A.

TABLE 2. Gender group B

Gender	Frequency	Percent
Female	9	64.3
Male	5	35.7
Total	14	100.0

The above table shows that 35.7 percent of the participants were male and 64.3 percent were female in group B.

TABLE 3. Interpretation of Craniovertebral Angle in Group A and B

Group	CVA	Mean° ±S.D°.	P Value
Group A	**CVA beforetreatment**	46.03±2.41	
	CVA after treatment	47.50±2.13	.006
Group B	**CVA beforetreatment**	44.42±3.49	.000
	CVA after treatment	52.71±3.66	

Significant increases in Cranio Vertebral Angle (CVA) post-treatment were found in both Group A (46.03±2.41 to 47.50±2.13) and Group B (44.42±3.49 to 52.71±3.66), with $P < 0.05$, indicating statistical significance and suggesting positive effects of PNF on cervical rehabilitation in both groups.

TABLE 4. Interpretation of the Paired Sample Statistics using NDI:

Groups	NDI	Mean° ±S.D°.	P Value
Group A	**Pre NDI**	50.29±9.211	
	Post NDI	17.83±6.825	P<0.05
Group B	**Pre NDI**	59.07±12.04	
	Post NDI	25.79±10.46	P< 0.001

Participants treated with neural gliding showed a significant decrease in NDI scores from 50.29±9.21 before treatment to 17.83±6.82 after ($p < 0.05$). Similarly, those treated with Rhythmic

Stabilization decreased from 59.07±12.04 to 25.79±10.46 ($p < 0.05$), indicating significant improvements in NDI scores post-treatment, highlighting the effectiveness of PNF interventions in reducing neck disability.

TABLE 5. Effects of neural glide on NPRS

Group	Pain	Mean° ±S.D°.	P Value
Group A	**Pain before treatment**	7.07±.475	
	Pain after treatment	3.07±.730	0.00
Group B	**Pain before treatment**	7.21±.426	0.00
	Pain before treatment	3.00±.679	

Participants treated with median nerve glide and in Group B showed significant decreases in NPRS scores post-treatment ($p < 0.05$), indicating effective reduction in pain intensity with PNF interventions.

TABLE 6. Comparison of pre and post values of joint position sense error (JPE)

Groups	Pre Mean± SD	Post Mean± SD	P-value
Group A	5.05± 0.88	4.40± 0.86	0.059*
Group B	5.15 ± 0.74	2.55±0.686	<0.001*

The table shows significant improvement in reducing joint position error (JPE) with PNF (rhythmic stabilization) in Group B ($p < 0.05$), compared to Neurodynamics (Median nerve glide) in Group A ($p > 0.05$). This suggests PNF (rhythmic stabilization) is more beneficial for improving.

TABLE 7. Comparison of NDI, NPRS and CVA between Groups:

	GROUP	Mean±Std. Deviation	P-value
Post NDI	GROUP A	17.83±6.825	P>.025
	GROUP B	25.79±10.467	P>.026
Post CVA	GROUP A	47.50±2.139	P<.005
	GROUP B	52.71±3.66	P<.000
Post NPRS	GROUP A	3.07±.730	P<0.00
	GROUP B	3.00±.679	P<0.00

NDI= neck disability index, CVA= craniovertebral angle, NPRS= numeric pain rating scale

DISCUSSION

Cranio vertebral angle was used as a screening tool and then participants who included into the study their CVA angle was measured at baseline and then after last session. And cranio vertebral angle was increased with a value in group B (rhythmic stabilization), then in Group A (Median nerve glide).In another study revealed that Deep Cervical Strengthening Exercise and PNF exercise showed same effect to improve JPE and pain on neck region. But there was no significant difference b/w them (12).

According to (Abhilash, et al., (2018)concluded that the nerve gliding with conservative treatment has better result in managing pain and disability in patients with CR.. In the current study neurodynamics with PNF have shown better results in pain reduction and neck disability. By supporting of current study they divided into three groups such as Group A received MET, Group B received PNF and Group C received isometric exercise for four weeks. Results of this study showed that both treatments are effective in improving function and decrease pain (39).Another study(Jung,et al.,2013) shows that PNF(stabilizing exercise) technique have significantly decrease pain and improve function on NDI.

In this study result of (PNF) shows significant decrease in pain on NPRS and improving NDI function.

The results of above-mentioned study by Lee support the results of current study in which JPS

measured by head repositioning accuracy. The outcome indicated a positive connection among time and gathering in the, flexion, extension left and right turns. Cervical stabilization exercises had significant impact on improving joint position sense.

So, the study concluded that PNF technique improve pain, CVA, Joint position sense and NDI. There is significant improvement in pain and joint position error in cervical radicolupathy.

According to a case study conducted by Savva and Giakas (2013), 32 years old lady get better with the application of cervical traction and neurodynamics. The current study results are in the favor of that study. According to a systematic review conducted by Bassoon, et al. (2017), the neurodynamics techniques are very effective in managing pain, disability in neck and back pain, the current study give the same result that the pain got better with neurodynamics but in the current study patients having neck pain with radiculopathy and also with joint position sense problem. Current study results also showed significant correlation between pain and disability but non-significant correlation between Neurodynamics and PNF.

CONCLUSIONS

In conclusion, after reducing bias and con- founding, we found no difference in important clinical outcomes between two groups. However Proprioceptive neuromuscular facilitation is more effective for joint position sense, cranio-vertebral angle, and neck disability than those who received median nerve glide.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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COMPLIANCE WITH ETHICAL STANDARDS

Ethics approvals were obtained from Riphah International university Islamabad under Ref. no. RCR&AHS/REC/RCRS/19/2031.

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