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"Effect of Mulligan's Smwam among Subjects with Unilateral Cervical Radiculopathy"

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ABSTRACT

Background and objectives: Cervical radiculopathy (CR) is a peripheral nervous system disorder affecting the normal function of cervical nerve roots (CNRs) and is often associated with chronic pain and functional limitations in daily life. The objective of the study was to evaluate the effect of spinal mobilisation with arm movement in unilateral cervical radiculopathy.

Materials and methods: The present study was conducted among 30 subjects who included both male and female symptomatic unilateral cervical radiculopathy subjects from the age group of 21to 59 years. Subjects were randomly assigned into two groups of 15 each. 15 subjects of Group A were given spinal mobilization with arm movement along with conventional therapy (Interferential therapy and Neck isometrics).and another 15 subjects of Group B were given conventional therapy (Interferential therapy and Neck isometrics).Pretreatment assessment was taken on 1st day and post treatment assessment was taken at the end of the last day of 2nd week of intervention neck range of motion (flexion, extension, right lateral flexion, left lateral flexion, right rotation, left rotation) using Universal Goniometer, neck pain and disability using VAS and Disability Index (NDI).

Result: In the present study, outcomes that among the parameters of range of motion of the right lateral flexion, right and left rotation and flexion ($P<0.001$)have more significant in experimental group in extension and left rotation ($P>0.05$) .similarly pain and NDI also more significantly reduced in experimental group. Outcomes of table five evidences that the parameters like ROM of flexion and extension were significantly improved and lateral flexion on both sides and rotation on both sides were not significantly improved in control groups. The pain and NDI were significantly decreased in control group.

On the whole, while compare two, experimental group the outcome measures of ROM were significantly more increased than the control group as well as decrease in pain and NDI were also significantly more than the changes observed in controlled group so it implies that the intervention of SMWAM was significantly effective on pain range of motion and NDI amongthe subjects with unilateral cervical radiculopathy.

Conclusion: The results suggested that spinal mobilization with arm movement was effectiveon pain, Range of motion and functional activities among the subjects with unilateral cervical radiculopathy in experimental group than the control group treated with conventional treatment.

KEYWORDS: Unilateral cervical radiculopathy, Spinal mobilization with arm movements,NDI

INTRODUCTION

Cervical radiculopathy (CR) is a peripheral nervous system disorder affecting the normal function of cervical nerve roots (CNRs) and is often associated with chronic pain and functional limitations in daily life[1-6]. It is estimated that at least 1 out of 1000 individuals suffer from cervical radiculopathy in their lifetime. Cervical radiculopathy (CR) is associated with mechanical and/or inflammatory stimuli around the CNRs and several imaging studies have demonstrated cervical disc herniation and osteophytic encroachment to be the most common lesions that lead to nerve root compression, inflammation, or both.[3,5,6,12] These lesions may affect sensory and motor fibers of CNRs, producing neuropathic symptoms described as 'burning', 'shooting', 'sharp' pain or 'electric shock- like' sensory signs (numbness or paraesthesia) in specific dermatomes and motor signs like muscle weakness or loss of active movement in the upper-limb.[1,6,13,14,15]

Patients typically have severe neck and arm pain that prevents them from getting into a comfortable position. They may hold the arm over the head, typically resting the wrist or forearm on top of the head (the shoulder abduction sign12) and sometimes tilting the head to the contralateral side. The symptoms are usually aggravated by extension or lateral rotation ofthe head to the side of the pain (the Spurling maneuver). Aggravation of the symptoms by neck extension often helps to differentiate a radicular aetiology from muscular neck pain or a pathological condition of the shoulder

with secondary muscle pain in the neck. It is also important to remember that multiple sources of pain in the neck and upper extremity are common and that the nerve structures may be compressed at more than one site40,41.

The Mulligan concept is now an integral component of many manual physiotherapists clinicalpractice.[16]Mobilisations with movements (MWMs) is the terminology used when applying an accessory glide to an active peripheral joint movement.[17,18,19]The technique is pain free and can return comfortable mobility in just a few visits. Immediate pain relief and increases in your range of motion can be expected when this technique is indicated.[20]

Passive oscillatory mobilizations called 'NAGs ' (natural apophyseal glides) and sustained mobilizations with active movement ' SNAGs' (sustained natural apophyseal glides) are the mainstay of this concept's spinal treatment. Mulligan proposed that when an increase in pain- free range of movement occurs with a SNAG it is primarily the correction of a positional fault at the zygapophyseal joint, although a SNAG also influences the entire spinal functional unit (SFU).[18]

Spinal mobilization with arm movement :(SMWAMs)

When symptoms that are thought to be referred from the spine are present within the periphery, the use of mobilization at the appropriate spinal level should be considered in conjunction with extremity movement .Mobilizing force is applied to the appropriate spinal level and sustained as the patient performs the previously provocative extremity movement,in this context it's the arm. As with other forms of MWM, immediate improvement in range and symptoms is anticipated, thus establishing its efficacy. The terminology used to describe this technique is spinal mobilization with arm movements (SMWAMs)[21]

Studies have proven the effect of spinal mobilization with arm movement on several musculoskeletal disorders but no studies have found its efficacy on unilateral cervical radiculopathy. Techniques like SNAG, manual traction, mobilization with movement, Maitland mobilization were proven to be beneficial on cervical radiculopathy, but still broad intervention is required to explore the condition with advanced techniques, so the aim is to find the significance of spinal mobilization with arm movement on pain, range of motion and functional activities in unilateral cervical radiculopathy.

METHODOLOGY

Participants: The study included 30 participants, both male and females of age group 21-59 years who were screened for unilateral cervical radiculopathy for greater than 3 months and reported unilateral sensory and motor deficits including sharp pain, muscle weakness and numbness in the upper limb in the physiotherapy clinics. Subjects already diagnosed with unilateral cervical radiculopathy by orthopaedicians were also included. The participants were excluded if they had any other musculoskeletal pathologies of neck and shoulder and also if they were under any kind of treatment for the same in the past 3 months. Informed consent were taken from the subject. Subjects who fulfilled the inclusion criteria were assigned into two groups by simple random sampling technique. The randomization was blinded and the participants were also told not to discuss among themselves regarding the treatment they receive. The total study duration was for 6 months and there were no dropouts in the study.

Initial Assessment: A pre treatment Neck Disability Index (NDI) score for functional assessment, Visual Analogue Scale (VAS) for pain assessment and range of motion were assessed on the first day of the treatment. Active cervical spine range of motions (flexion, extension, bilateral side bending and rotation) were measured using a universal goniometer which has been shown to be a valid and reliable tool for the measurement of cervical range ofmotion in the sagittal ,frontal plane and transverse plane .

Intervention: The total duration of the study was 2 weeks .with 3 treatment sessions on alternative days in a week.

Group A (Experimental group) included 15 subjects and were given interferential therapy for 15 minutes according to dermatome level and neck isometrics were given in frequency of 20 sets per day with 6 seconds-hold time of 20% of maximal isometric contraction; along with 1 set of spinal mobilization with arm movement (1 set contains 6 glides). Group B (Control group)) included 15 subjects and were given only interferential therapy for 15 minutes according to the dermatome level and 20 sets of neck isometrics were given per day with 6 seconds-hold time of 20% of maximal isometric contraction. Post treatment Neck Disability Index,Visual Analogue Scale and range of motion were assessed on the last day of the 2nd week of the treatment to re-evaluate unilateral cervical neck pain.
Spinal mobilisation with arm movement

Mobilisation was performed depending on the side of involvement, the respective spinous process should be mobilised along with shoulder movements (flexion/ abduction/ horizontal adduction/ horizontal abduction). The physiotherapist stood behind the seated patient and approached the desired level of spinous process from medial aspect with the thumb of one

hand, which is reinforced by the index finger of the other hand. Pure transverse glide is performed from affected to unaffected side; while the glide is sustained, patient performs the offending movements (flexion/ abduction, horizontal adduction /horizontal abduction). If the placement of the thumb is correctly on the spinous process then the patient will not feel pain at all. Six glides with respective arm movements were given per set of treatment. After several repetitions if the patient was not able to move the arm in the offending direction without symptoms, the treatment was discarded. If successful, two more sets of these pain free spinal mobilizations with arm movement were given. A very important rule for the technique is that the glide in the chosen direction must not be released until the patient's arm returns to the starting position.

RESULTS

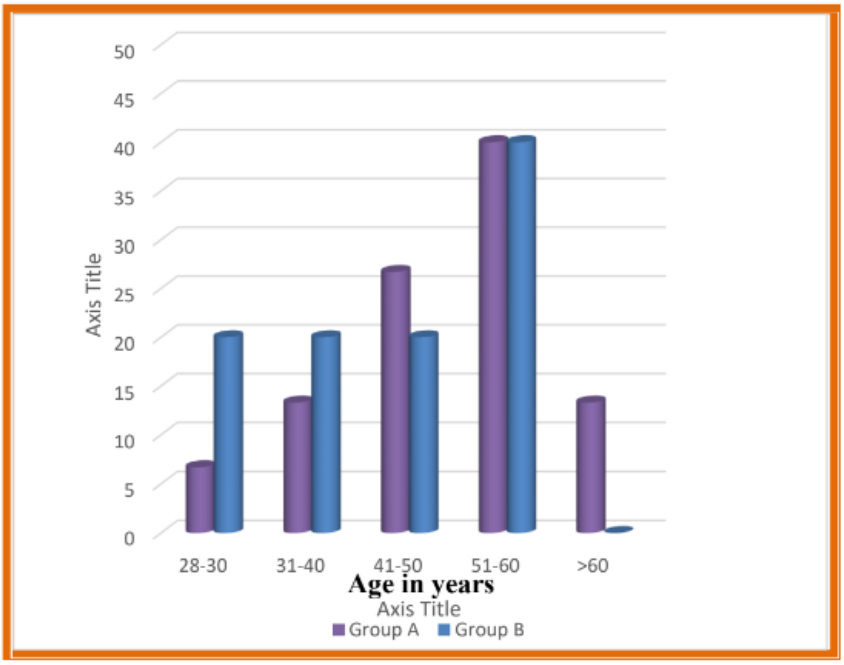
Statistical Methods: The Statistical software namely SPSS15.00, Stata 8.0, Med-Calc 9.0.01 and systat 11.00 were used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables etc.

Descriptive statistical analysis had been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. Mann Whitney U test has been used to find the significance of study variables between two groups and Wilcoxon Signed Rank test has been used to find the significance of study variables in Pre and Post.

Table 1: Comparing the age distribution of patient studied

Age in years	Group A		Group B	
	No	%	No	%
28-30	3	6.7	9	20.0
31-40	6	13.3	9	20.0
41-50	12	26.7	9	20.0
51-60	18	40.0	18	40.0
>60	6	13.3	0	0.0
Total	45	100.0	45	100.00
Mean ± SD	49.75±11.58		42.11±11.64	

Samples are age matched with **P=0.175**

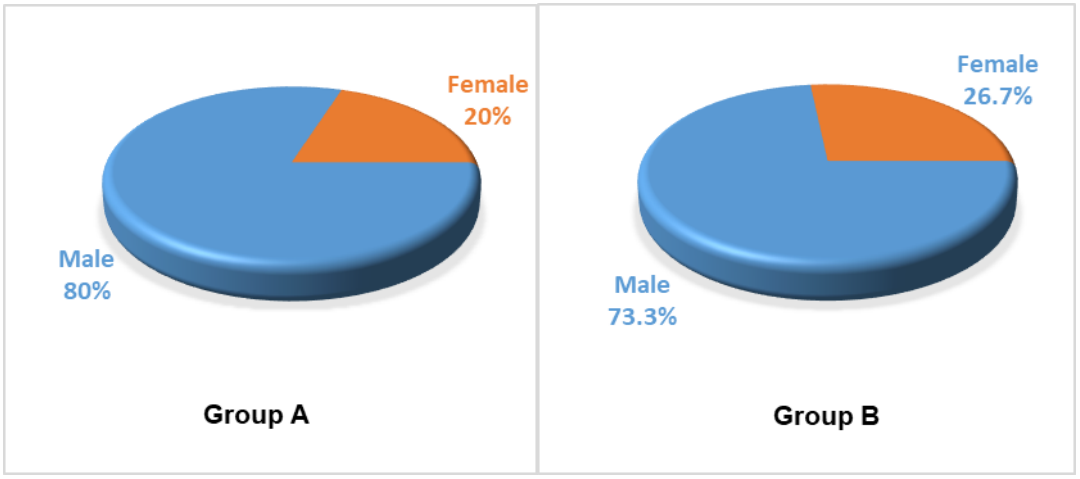


Graph Bar 1

Table 2: Sex distribution for patient studied

Gender	Group A		Group B	
	No	%	No	%
Male	36	80	33	73.30
Female	9	20	12	26.70
Total	45	100	45	100

Sample are gender matched with **P=1.00**

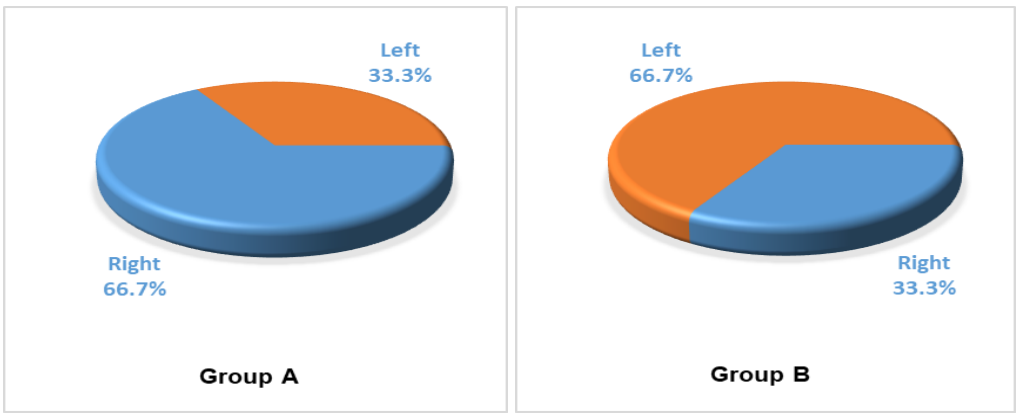


Graph Pie Chart 2.0

Table 3.0: Sides involvement

Side involved	Group A		Group B	
	No	%	No	%
Rt	30	66.70	15	33.30
Lt	15	33.30	30	66.70
Total	45	100	45	100

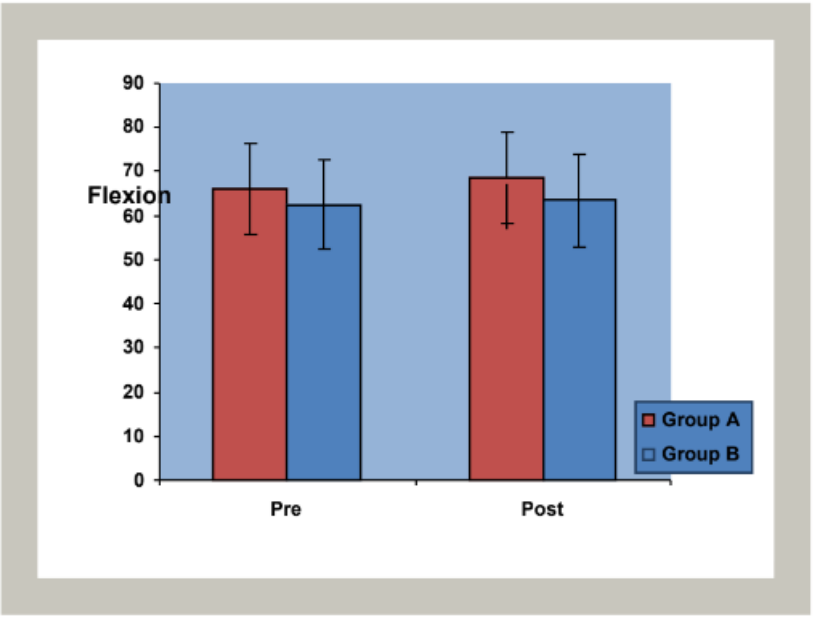
P=0.068+



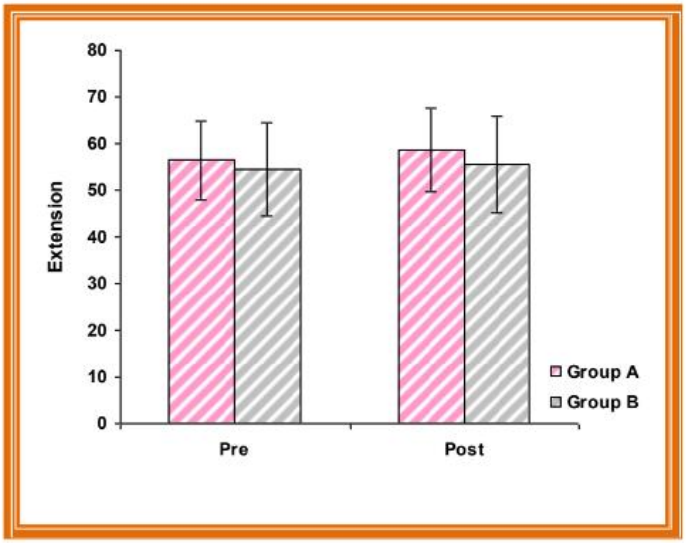
Graph Pie 3

Table 4.0: Comparison of Neck ROM in Degrees

Cervical ROM	Pre to Post	Group:A	Group:B	P:value
Flexion	Pre	67.07±11.23	63.43±9.96	0.143
	Post	67.50±11.13	62.40±10.58	0.149
	% change	3.9%	1.8%	-
	P:value	0.002*	0.010*	-
Extension	Pre:	55.40±8.41	55.47±10.16	0.629
	Post:	56.53±8.92	53.46±10.27	0.385
	% change:	3.7%	1.7%	-
	P value:	0.002**	0.027*	-
Lateral Flexion-Right	Pre:	21.20±5.44	26.07±8.55	0.348
	Post:	25.67±7.90	26.87±8.68	0.685
	% change:	12.1%	4.19%	-
	P value:	0.001**	0.051*	-
Lateral Flexion-Left	Pre:	27.40±8.10	22.80±4.88	0.014*
	Post:	31.33±10.24	23.73±5.37	0.004**
	% change:	7.79%	5.27%	-
	P value:	0.002**	0.007**	-
Cervical rotation-right	Pre:	54.60±5.98	54.40±5.64	0.413
	Post:	55.63±5.98	55.94±5.63	0.776
	% change:	3.72%	0.96%	-
	P value:	0.001*	0.024*	-
Cervical rotation –left	Pre:	55.85±6.74	53.88±5.62	0.568
	Post:	57.21±6.55	54.54±6.70	0.369
	% change:	2.39%	1.3%	-
	P value:	0.001*	0.015*	-



Graph Bar 4 (a)



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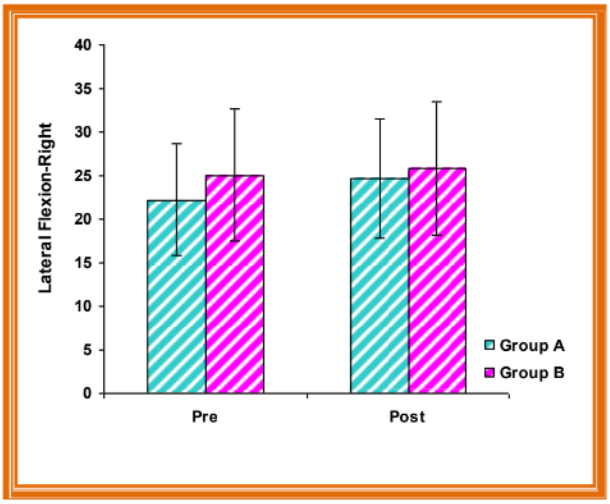

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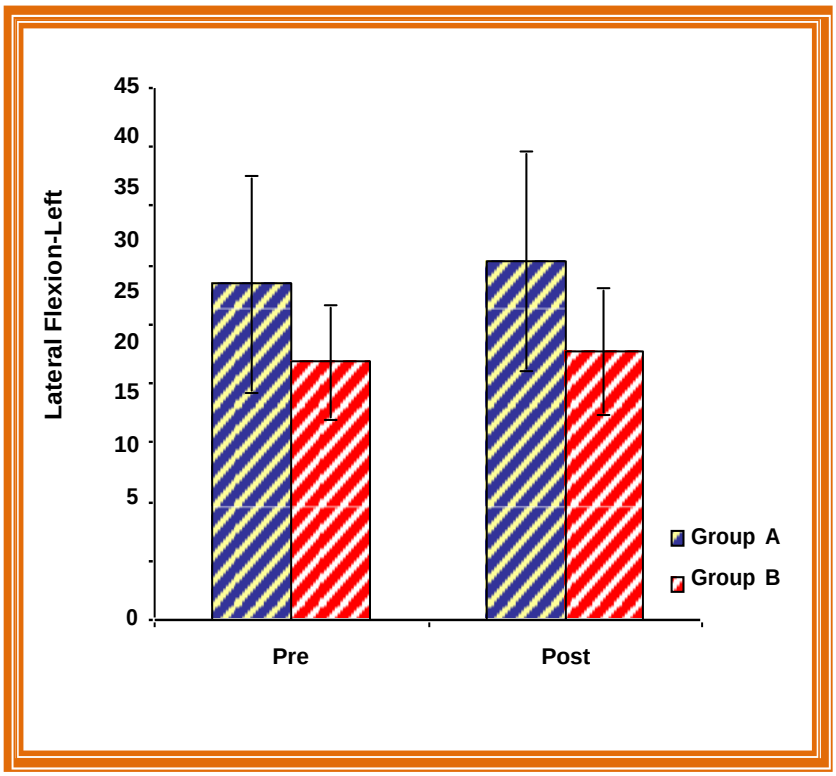

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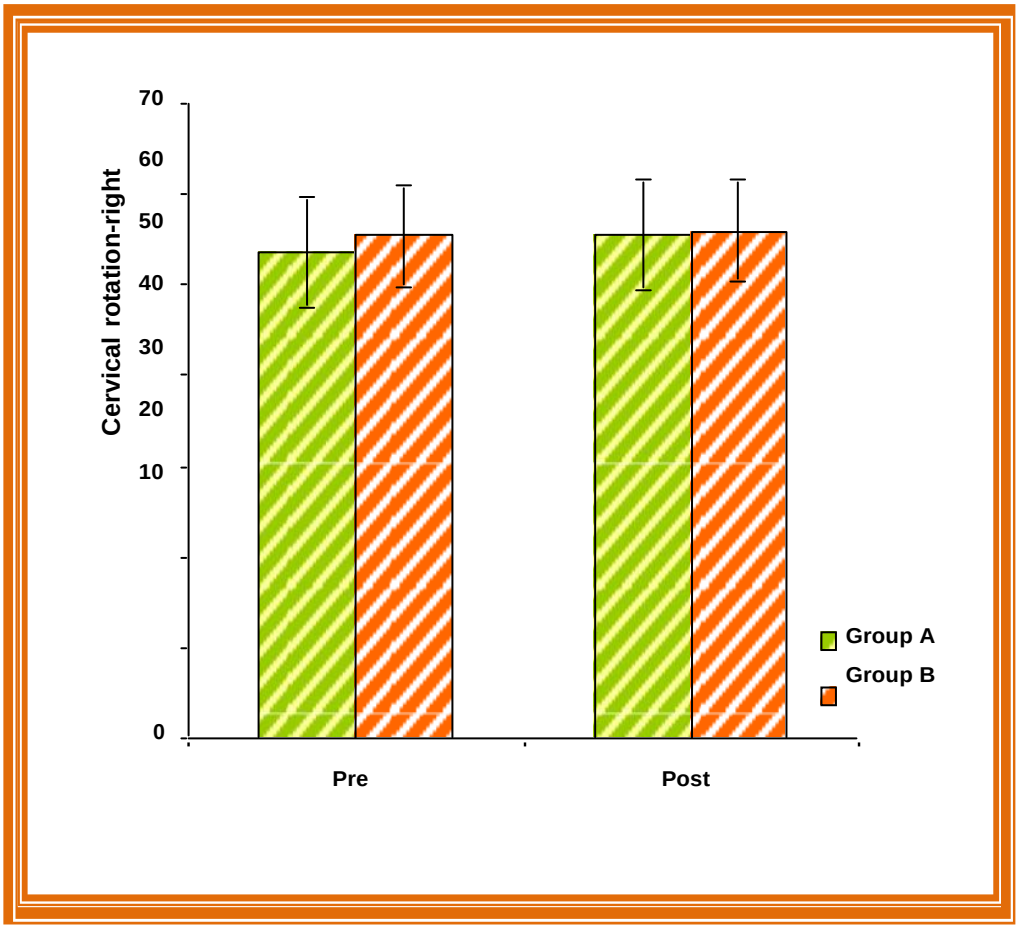
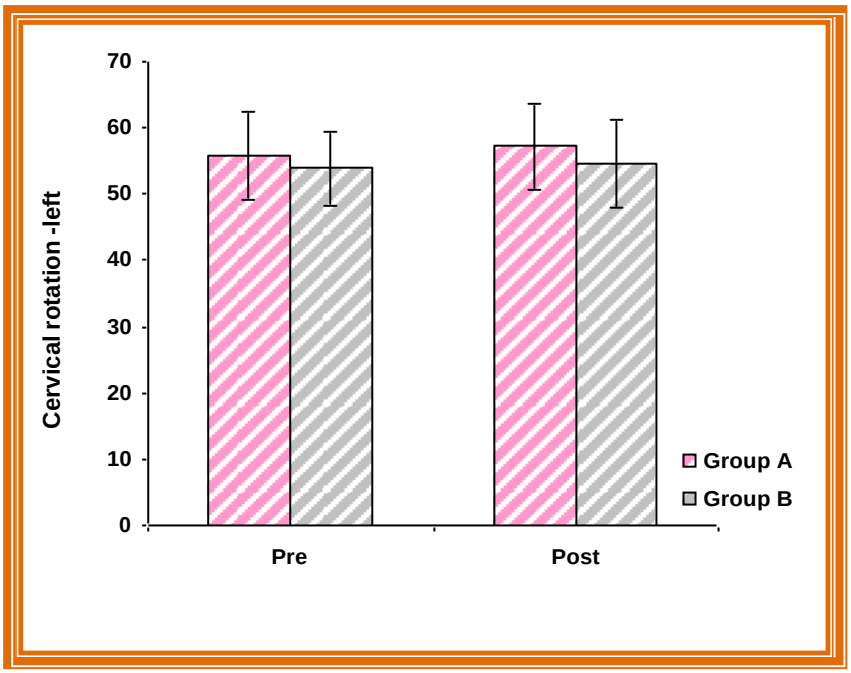


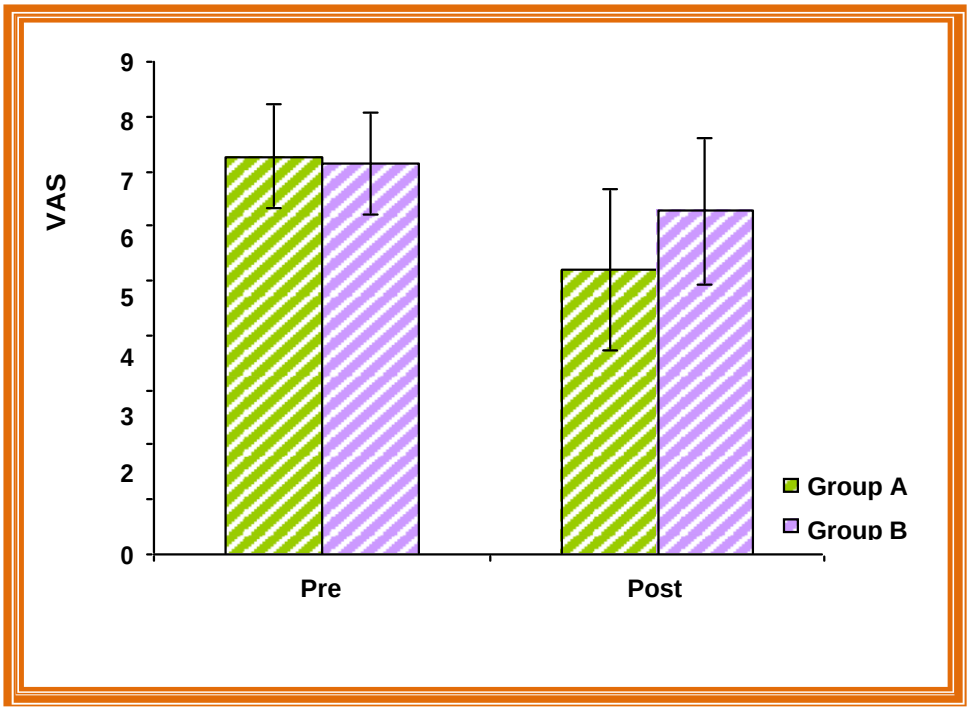
Graph 4 (e)



Graph 4: (f)

Table 5: Comparison of Visual Analogue Scale scores

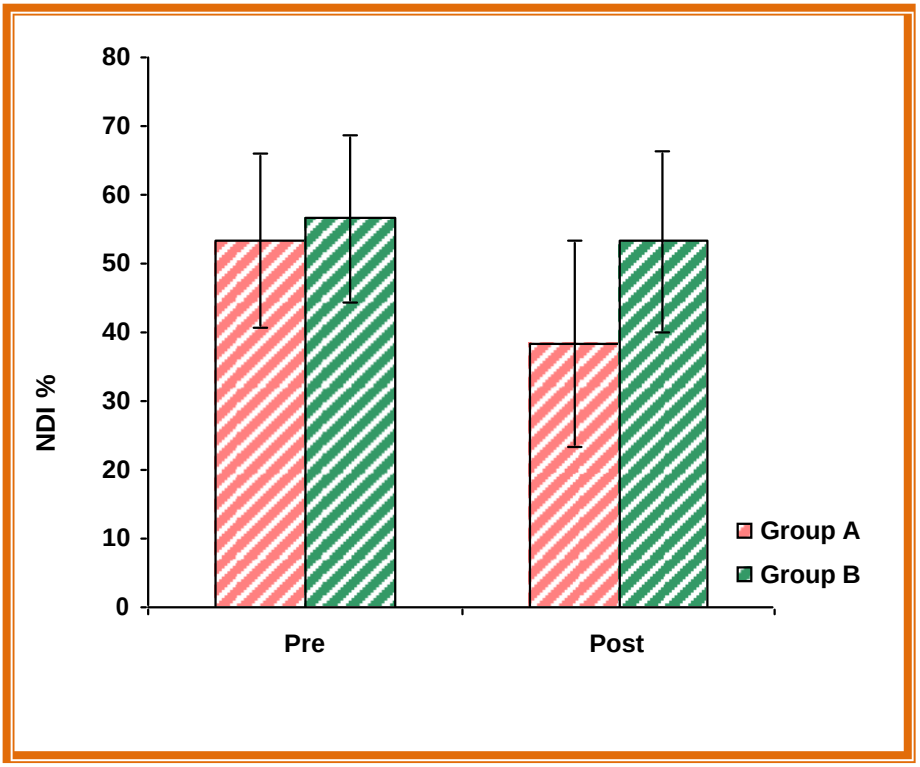
VAS	Group A	Group B	P Value
Pre:	7.28±0.97	7.14±0.93	0.741
Post:	5.21±1.46	6.28±1.34	0.058+
% change:	28.44%	12.07%	-
P value:	0.001*	0.011*	-



Graph : 5

Table 6: Comparison of NDI scores

NDI %	Group A	Group B	P value
Pre	53.34±12.76	56.54±12.18	0.596
Post	38.26±14.97	53.34±13.18	0.014*
% change	28.24%	5.68%	-
P value	0.001*	0.018*	-



Graph: 6

DISCUSSION

The purpose of the study was to evaluate the effect of Spinal Mobilization with Arm Movement in the treatment of unilateral cervical radiculopathy and the results of the study showed a highly significant increase in the cervical range of motion (flexion, extension,lateral flexion and cervical rotation) in the experimental group when compared to the control group which showed a moderately significant increase in the cervical range of motion. The possible mechanisms for this increase may be due to the reason that the SMWAM may have caused stimulation of joint receptors via passive mobilisations would have had an reflex effect on segmental muscle activity and thus increased the cervical range of motion. Due to transverse glide, the vertebral body rotates towards the same side, resulting in opening of foramina on the affected side. Adding arm movement with opened foramina will result in mobilization of affected tissues. The pain might also be reduced due to the fact that spinal movements also occur along with the shoulder movements, as the shoulder girdle muscles have their attachments from cervical and upper thoracic vertebra Moulson and Watson (2006)21

During the performance of Spinal mobilization with arm movements there is accessorymovement (glide) being applied to the spinous process of cervical vertebra, this movement within the spine, improves the circulation and nutrition to the joint. An increased circulation led to the wash out off nociceptive metabolites and better nutrition heals minor injuries sustained by soft tissue entrapped within, thus bringing out smooth and pain-free physiological movements in the arm.

Cyriax and Cyriax stated that the reference pain that causes limited movement of the shoulderjoint can originate in the neck. They further stated that there is an interrelationship ofshoulder joint motion and cervical motion. McClithie et al.

reported that performing mobilization of the C5 spinous process resulted in a reduction in arm pain. When mobilization of the neck is performed, it releases the impingement of the ganglion, improvingshoulder joint movement that is hampered by a neurologic problem. Wang and Meadows also reported that the abductor muscle strength of the shoulder joint improved after performing mobilization of the C5–6 joint. Pikura performed a study of the effects of spinal manipulationon immediate pain decrease and range of motion. He stated that there was an immediate in pain as well as an improvement in decrease range of motion after one treatment. Further, Kanlaynaphotporn et al. also stated in their study, that after one application of mobilization, 30 people in the experimental group experienced an immediate decrease in pain and an increase in range of cervical motion.[30]

LIMITATIONS AND SUGGESTIONS

The study has certain limitations such as: small sample size, no long term follow-up, tedious on mobilising in patients with severe tenderness and the dominance of individuals. The futurestudies can include other cervical problems also as unilateral cervical radiculopathy accounts for only a very small percentage with larger sample size. Long term effects of SMWAM and more regular assessments during the intervention period to determine the time frame of improvements can be done. Investigations are needed to determine the delineation between the specific and non specific elements of manual therapy and the rationale for adapting the specific intervention according to the repeated assessment findings. To overcome tenderness of spinous process mobilisation, glides can be given to the superior spinous process segments. Instead of arm movements, future studies can advice active neural mobilisation along with spinal mobilisation according to the involved nerve or facet joint mobilisation can be applied along with SMWAM. Further studies can take any other functional scale to measure functional activities and advices must be included to maintain correct posture of the neck; home exercise program could be proposed.

CONCLUSION

Results show that outcomes in the form of V.A.S, N.D.I percentage and R.O.M showed significant difference in subjects having unilateral cervical radiculopathy who received SMWAM in comparison to conventional therapy treatment. Hence this study concluded that the effects of SMWAM will produce significant difference in the treatment of unilateral cervical radiculopathy.

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