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Efficacy of Spinal Mobilization with Arm movements (SMWAMS) in Mechanical Neck pain patients: Case-Controlled Trial

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ABSTRACT

Neck pain is becoming increasingly prevalent in society. Estimations indicated that 67% of individuals will suffer neck pain at some stage throughout life. Neck pain is a major problem in the society, with an increasing sedentary population especially with reliance on technology in the work place. Both manual therapy and exercise therapy are known to have beneficial effects on neck pain. The purpose of this study was to determine the efficacy of spinal mobilization with arm movements (SMWAMS), a technique of Mulligan concept, in patients with mechanical neck pain. Methods: 30 participants of mechanical neck pain were selected by simple random sampling and were allocated to two groups, 6 treatment sessions over a period of 2 weeks were given. One group received SMWAMs with supervised neck exercise program, while the other group received only supervised exercise program. Both groups received deep neck flexor training with pressure biofeedback (PBF) unit. The Neck pain and Disability scale, patient specific functional scale and global rate of change scale scores along with cervical range of motion were outcome measures assessed in pre and post assessment. Statistical comparison within group and between the groups was made. Result: Post intervention of 2 weeks, the subjects in the Experimental group had a significantly better improvement in pain and disability scores (P <0.0142) and improved patient specific function (P<0.0159) than the control group. Conclusion: The present study indicates that Spinal mobilization with arm movements (SMWAMs) was more effective than supervised exercise program, in reduction of pain, disability and improvement of functional ability.

Key words*: mechanical neck pain, manual therapy, Mulligan school of manual therapy, spinal mobilization with arm movements (SMWAM), Deep neck flexors.*

INTRODUCTION

Neck pain is becoming increasingly prevalent in society. Estimations indicated that 67% of individuals will suffer neck pain at some stage throughout life. The current research incidence of neck pain in Bangalore has been estimated as 35% and the median age as 27 years and it ranges between 18 to 52 years.(1) Throughout the world where statistics are available, neck pain is increasingly reported as a problem. Epidemiological surveys show that 45-71% of people recall an episode of neck pain that affected their activities of daily living. (2)

The term 'Mechanical Neck Pain' can be explained as the physical forces acting upon the cervical spine. Pain can be caused by abnormal stress and strain on the vertebral column and surrounding structures through poor posture, lifting and sitting habits. Gatterman and Bergman (3) et al state the most common cause of mechanical neck pain is zygapophyseal joint locking and muscle strain. Grieve (4) suggested that in the absence of trauma and major injury, one of the greatest causes of neck pain is poor posture.

The mulligan concept approach to Orthopedic Manual Physical Therapy (OMPT) was conceived by a New Zealand Physiotherapist by the name of Brian Mulligan. As in most other approaches to OMPT, the mulligan concept approach in based on a firm understanding of functional anatomy and kinematics. However, there are several components of this approach that render it unique. Mulligan consistently found that, when indicated, the combination of accessory joint mobilization with concurrent physiologic movement provided immediate, significant and lasting changes in the patient's condition. The improvements that Mulligan observed, in response to these new techniques occurred so quickly and were of such magnitude that they could not be explained by the gradual nature of the typical healing process. (5)

Spinal mobilization with arm movements (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 (SMWAM). [5]

Here a sustained transverse glide to the spinous process of a vertebra is applied while the restricted peripheral joint movement is performed actively or passively. The mobilization must result in a symptom-free movement. Mulligan proposed that their application was appropriate when peripheral joint limitation of movement could be spinal in origin.[6] This technique is based on the knowledge that when the shoulder girdle moves, the muscles attached to the scapula, cervical vertebrae, and upper thorax cause simultaneous spine movement. This technique combines the advantages and characteristics of spinal mobilization and manipulation to maximize the treatment effect, and it has been demonstrated to be a manual therapy technique which mitigates the defects of both types of treatment. This technique can be easily performed, and one of its advantages is that, if the basic principles are followed faithfully, the treatment can be done safely and effectively. [7]

Neck musculature and exercise

In order to improve patients' functional status and quality of life, it is important to understand which structures are capable of producing pain and disability. Over the past decade, numerous studies have shown an association between reduction in the strength and endurance capacity of the cervical muscles and neck pain. It has been found that certain muscles in the cervical spine tend to weaken in neck pain; the most common of these being the deep and anterior cervical flexors. [8] A study of patients with neck osteoarthritis showed more pronounced fatigue curves for anterior and posterior neck muscles than for the muscles of the control group. [9] Thus, in order to gain muscle strength, flexibility and endurance, to restore injured tissues, and to contribute to ability to sustain normal life activities, exercise is one of the most frequently used modalities in the rehabilitation of subjects with neck pain.

However there are very few evidences in literature proving efficacy of spinal mobilization with arm movements in the management of mechanical neck pain, thus warranting the need for this study. However other modalities of treatment like exercise therapy have an important role to play in the management of mechanical neck pain. The main objective of the study to determine the efficacy of spinal mobilization with arm movements (SMWAMS) with exercises by analyzing pre and post treatment levels of pain, disability and functional ability and cervical ROM.

METHODS

This case controlled trial was conducted in the Physiotherapy OPD.27 of D.Y. Patil Hospital and Research Centre. Materials used were CROM for measuring cervical ranges, Stabilizer pressure biofeedback by Chattanooga and a proforma comprising of demographic details, assessment findings and scales. By means of simple random sampling 30 subjects (both males and females) diagnosed as mechanical neck pain were selected and purposive sampling method was used; Group A was treated with SMWAMs along with supervised exercise program while Group B was treated with supervised exercise program only. Pre and post treatment assessment included Neck pain and disability scale (NPAD), Patient Specific functional scale (PSFS), global rate of change (GROC) scale and cervical ROM was taken. Patients having mechanical type of neck pain with an intensity of pain varying between 4-7 on a Numerical Pain Rating scale (NRS), belonging to age group 20 to 60 years and able to read and understand either English or Hindi were included. Patients were excluded if they had a previous history of injury to the neck or upper back from T1–T6, any inflammatory condition, *e.g.*, rheumatoid arthritis, previous surgery to the neck, a history of malignancy, congenital abnormality of the spine, neurologic signs and symptoms, *e.g.*, muscle weakness or changes in spinal reflex jerks, other musculoskeletal problems at the same time Written consent was taken from all participants to undergo treatment.

Participants were allotted to one of the 2 groups; Group A-Experimental group and Group B-Control group. Refer Figure 1 at the end.

Group A (Experimental group) - Patients in this group were treated with Mobilization and exercises. Mobilization technique of Spinal Mobilizations with Arm movements (SMWAMs) was performed on the patient. Exercises included posture correction exercises and deep neck flexor training the help of Stabilizer pressure biofeedback. ***Spinal mobilization with arm movements (SMWAMs):***

Indications:

- End range pain with shoulder movements like abduction, horizontal adduction or a painful arc
- Rhomboid pain felt by the patient when the arm is adducted across the body in the horizontal pain.
- Pain radiating down to the hand with arm movements that involve moving the shoulder girdle.
- Painful shoulder movement due to stiff cervical spine (C_7 and T_1)

Procedure for spinal mobilization with arm movements (SMWAMs)Refer Figure 2.1 and 2.2

Patient position

- Sitting upright on chair

Therapist position

- Standing behind the patient

Hand placement

- Approach the desired level of spinous process from medial aspect of the thumb of one hand, which is reinforced by the index finger of the other hand.

Mobilization

- 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)

Group B (control group)- Patients in this group were treated only with exercise, which included posture correction exercises and deep neck flexor training with the help of Stabilizer pressure biofeedback.

Apart from the above mentioned interventions, both groups were given adequate education and ergonomic advice. Both groups received 6 treatments lasting for the duration of about 30-45 minutes over a period of 2 weeks, 3 sessions per week on alternate days.

Statistical analysis and Results

Mann – Whitney U test was used for between group comparisons, while Wilcoxon Signed Rank test was used for within group comparison. Level of significance was kept at 5%. The mean age of patients in group A and B was 37.8 and 38.5 years respectively. (Refer table 1). There was a significant difference in the neck pain and disability scores (Refer Table 2) between Groups A and B at the end of 2 weeks of follow up (p= 0.0142), with greater improvement in Experimental group. The change in the PSFS scores (Refer Table 3) from pre-treatment to 2nd week post treatment between Group A and Group B was shown to be significant (p=0.0159), with greater improvement in the Experimental group. Comparison of between groups ROM was having significant difference and comparison of between groups VAS was having no significant difference. The GROC scores (Refer Table 4) between the 2 groups was shown to be non-significant, which indicates that there was no significant difference in the rate of change of the health status of the participants over a period of 2 weeks when both Group A and B interventions were compared.

RESULTS

Table 1: Mean age of patients in Groups A and B

Group	Mean	SD	SE	Lower 95% CI	Upper 95% CI	p-value
Group A	37.87	9.63	2.41	32.74	43.01	0.0178*
Group B	38.57	9.22	2.19	33.82	44.32	

Interpretation: The above table shows that in both the groups' i.e Group A and Group B, the subjects were matched with respect to age. Mean age of subjects in Group A and B were 37.8 and 38.5 years respectively.

Table 2: Comparison of improvements in NPAD scores between Group A and B

Group	Mean	SD	SE	Lower 95% CI	Upper 95% CI	p-value
Group A	23.93	10.64	2.66	18.26	29.60	0.0142*
Group B	15.35	6.84	1.83	11.40	19.30	

Interpretation: The change in the NPAD scores from pre treatment to 2 weeks post treatment was found significant, indicating that there was a reduction in pain and disability after 2 weeks of interventions in both groups, however Group A (EXP) showed greater improvements than Group B (Control).

Table 3: Comparison of changes in PSFS scores between Group A and B

Group	Mean	SD	SE	Lower 95% CI	Upper 95% CI	P value
Group A	3.51	1.32	0.33	2.81	4.22	0.0159*
Group B	2.44	0.80	0.21	1.97	2.90	

Interpretation: The change in the PSFS scores from pre treatment to 2 weeks post treatment between Group A and Group B was shown to be significant, which indicates there was a significant improvement in the functional outcome after 2 weeks of intervention in both groups. However, there was greater improvement in Group A than Group B.

Table 4: Comparison of change in GROC scales between Group A and Group B

Group	Mean	SD	SE	Lower 95% CI	Upper 95% CI	P value
Group A	4.56	1.41	0.35	3.81	5.31	0.0831 (ns)
Group B	3.57	1.55	0.41	2.67	4.46	

Interpretation: The GROC scores between Group A & Group B was shown to be non significant, which indicates that there was no significant difference in the rate of change of the health status of the participants over a period of 2 weeks when both Group A and B interventions were compared

NOTE:

Non significant – p value >0.05

* (significant) - p value ≤ 0.05

** (very significant)- p value ≤0.01

*** (extremely significant)- p value ≤0.001.

Figure 1- Flow chart of methodology

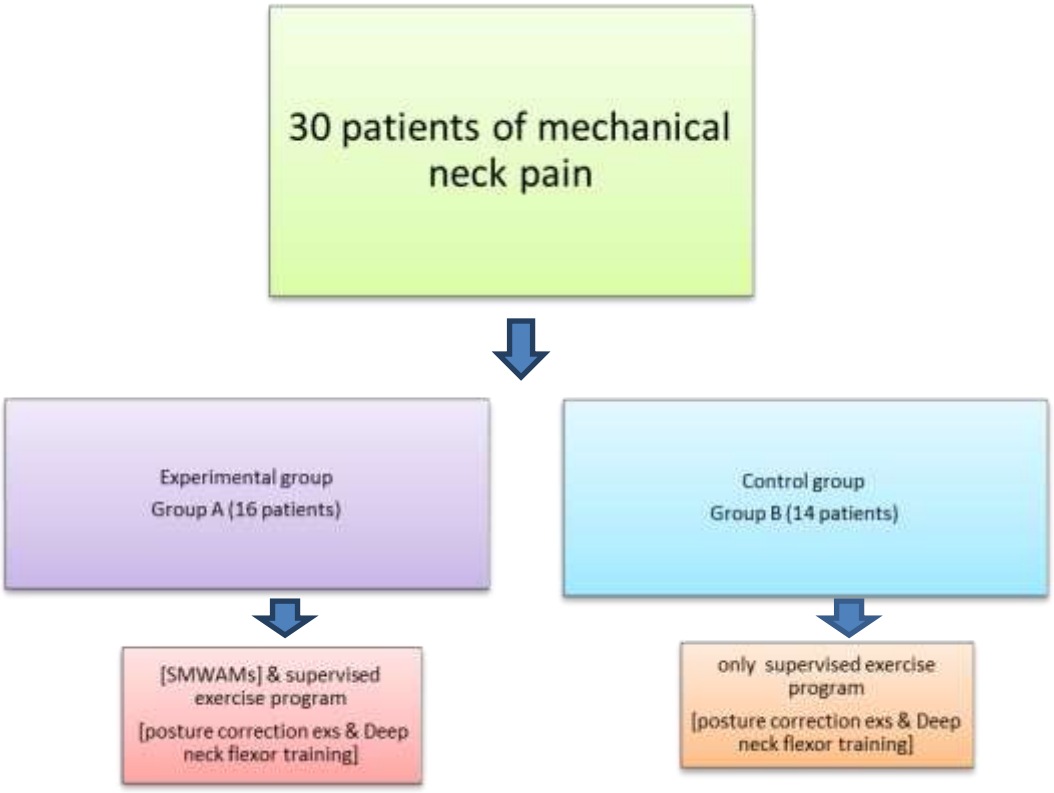

Figure 2.1 and 2.2- Performance of Spinal mobilization with arm movements (SMWAM)

Figure 2.1- Therapist's hand position for performance of SMWAM

Figure 2.2- Performance of SMWAM with offending movement of shoulder flexion

DISCUSSION

As per the statistical analysis, there was significant improvement in both groups, Experimental and Control. However, Experimental group showed better improvements in comparison to the Control group. The mainstay of Group A was the application of spinal mobilization with arm movements (SMWAMs).

Influence of SMWAM on neck pain and disability

Mulligan concept of mobilization explains how in the case of radiating pain, neural tissues may be adhered to the surrounding structures, resulting in lack of sliding and gliding, and hence giving additional stretch to the nerve. 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 [(10)]. Moulson and Watson (2006) brought out that sympatho-excitatory effect of mulligan technique can be taken into account to advocate the decrease in pain after giving SNAGs. [(11)] The activation of afferent nerve endings through manual contact influences the spinal cord neurons, inhibiting nocioception and motor neuron pool (Hearn and Rivett, 2002); this also can be a reason that marks the reduction of pain in neutral position. Mechanoreceptors involved in the pain modulation get stimulated as a consequence of stretch of the capsule brought about by spinal mobilization. An afferent impulse is sent to higher centers through the large diameter myelinated neurons, which modulates and inhibits the incoming nociceptive information. [(12)] Passive joint mobilization may, therefore, provide pain relief by activating this spinal gate control mechanism (Melzack and Wall, 1965). [(13)]

During the performance of Spinal mobilization with arm movements there is accessory movement (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. [(10)]

Influence of Exercises on neck pain and disability

Another reason for pain relief observed in the Experimental group could be due to the exercises. This research on mechanisms of pain reduction through exercises explains that, an increase in endorphins that occurs after training and better neuromuscular control may decrease pain. Muscle contractions activate muscle ergoreceptors (stretch receptors). Afferent from these muscles cause endogenous opions to be released and also the beta-endorphins from the pituitary gland. These secretions may cause both peripheral and central pain to be blocked. Neck exercises may allow the musculotendinous proprioceptors to downgrade their stretch reflex responses using operant conditioning techniques and multiple practice sessions. [(14)]

Effect of SMWAM and exercises on patient's functional status

Patient Specific Functional scale (PSFS) was used to observe the changes in the functional status of the participants. Studies done to observe the responsiveness of PSFS, revealed that in patients with neck dysfunction, the Minimal detectable change (MDC) was calculated to be 0.99 PSFS points for an average of 3 activities and 1.18 PSFS points for an individual activity. They also found that PSFS was more responsive in specific, rather than generic, conditions [(15)]. There was a greater improvement in the PSFS scores of participants in Experimental group. This can be attributed to the reduction in the level of pain and disability and also the improvements in cervical and shoulder ROM. With the application of SMWAMs in Group A, the patients were able to perform their functional activities involving the affected arm better as the pain which was hindering the functional use of the arm is reduced allowing for greater ROM and function at the shoulder. Also, when both the groups were compared (refer Graph 24), Experimental group showed higher PSFS scores with a significant p value of 0.0159.

In this study, both groups showed significant improvements, however there were better results observed in Group A i.e. the experimental group. The results of this study indicate that physical therapy exercises are efficient in bringing about resolution of patients symptoms and improving their functional status, however manual therapy in the form of mobilization, particularly Mulligan's mobilization technique of Spinal mobilization with arm movements (SMWAMs) can be added as an adjunct to the physical therapy intervention to bring about better improvements in the patients overall functional ability.

CONCLUSION

Spinal mobilization with arm movements (SMWAMs) with supervised exercise program showed better clinical outcomes as compared to only supervised exercise program only with respect to pain, disability and functional ability.

Declaration of interest: The authors report no conflict of interest.

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REFERENCES

1. Harms Ringdahl K, Ekholm J Schuldtk, Nemoth G, Arborelius. Load movements and myoelectric activity when the cervical spine is held in full flexion and extension, *Ergonomics;* 1986: 29(12): 1539-1552.
2. Dr.Deepak Sharan. A Prevalence study of neck disorders in Bangalore, *Deccan Heralds,* 2004-2005, Volume (3)2 Page No: 23-35.
3. Gatterman, M.I. 1990. Chiropractic management of Spine related disorders. Baltimore William and Wilkins.
4. Grieve, G.P. Common Vertebral Joint Problems. 2nd edition. Edinburg: Churchill Livingston, Longman Group Limited, 1988.
5. Orthopaedic Manual Physical Therapy from Art to Evidence by Christopher H Wise.
6. Masterclass by L. Exelby on 'The Mulligan concept: Its application in the management of spinal conditions.' *Manual Therapy* (2002) 7(2), 64–70.
7. Youngjoon Seo, Jaeseok Leeand Dongwook Han. The effects of spinal mobilization with arm movements on shoulder muscle strengthening. *Journal of Physical Therapy Science.* 2015 Jan; 27(1): 11–13.)
8. Dusunceli Y, Ozturk C, Atamaz F, Hepguler S, Durmaz B. Efficacy of neck stabilization exercises for neck pain: A Randomised controlled Study. *Journal of Rehabilitation Medicine* 2009; 41: 626–631
9. Silverman J, Rodriquez AA, Agre JC. Quantitative cervical flexor strength in healthy subjects and in subjects with mechanical neck pain. *Archives of Physical Medicine and Rehabilitation* 1991; 72; 679-681.
10. Manual of Mulligan Concept. 1st edition, 2014.Dr. Deepak Kumar & Brian R Mulligan.
11. Moulson A and Watson T (2006). A preliminary investigation into the relationship between cervical snags and sympathetic nervous system activity in the upper limbs of an asymptomatic population. *Manual Therapy,* 2006 Aug; 11(3): 214-24.
12. Hearn A and Rivett D.A. (2002). Cervical SNAGs: a biomechanical analysis. *Manual therapy,* 2002 May; 7 (2):71-79.
13. Melzack R and Wall. (1965). Pain mechanisms: a new theory. *Science* 150:971-979.
14. Zaheen Ahmed Iqbal, ReenaRajan, Sohrab Ahmed Khan and Ahmad H. Alghadir. Effect of Deep Cervical Flexor Muscles Training Using Pressure Biofeedback on Pain and Disability of School Teachers with Neck Pain. *Journal of Physical Therapy Science*; 2013 Jun; 25(6): 657–661.
15. Hefford C, Abbott JH, Arnold R, Baxter GD. The Patient-Specific Functional Scale: Validity, Reliability, and Responsiveness in Patients with Upper Extremity Musculoskeletal Problems. Journal of Orthopaedic & Sports Physical Therapy, Volume 42, Issue 2. Page 56-65.