

Summary

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Introduction: The cervical spine, area of the vertebral column commonly referred to as the neck, is designed for holding the head up and directing gaze in horizontal and vertical plane. Neck is meant for relatively large amount of mobility moving around 600 times every hour (Bland and Boushey, 1990). Neck pain being one of the commonest musculoskeletal disorders has a multifactorial aetiology and its development is dependent on the presence of more than one risk factor (Côté *et al.*, 2008). Neck pain varies widely between studies, with a mean point prevalence of 7.6 % and mean lifetime prevalence of 48.5 % (Cleland *et al.*, 2005). MaCaulay *et al.*, (2007) reported that neck pain has personal (pain and stiffness), social (disability) and health system costs. Increasing inclination towards manual therapy was seen in a U.S. survey carried out by Wolsko *et al.* in the year 2003, where 54% of total patients sought treatment from manual therapist. Manual therapy using Mulligan concept especially the Natural apophyseal glides (NAGs) is used as an integral component of practice by number of therapists throughout the world. The studies on efficacy of NAGs in treating spine problems, perhaps, are not available in the literature. In this era of evidence-based practice, there is always a need to cross validate the claims made by the proponents of a technique. The limited evidence on the effectiveness of Mulligan techniques in the cervical spine, absence of literature on its efficacy in improving the cervical spine range of motion and recuperating the patient's daily activities are the factors that contributed to undertake the present study. Thus, this study is an attempt to establish scientific evidence about the efficacy of NAGs in benefiting the patients. The aim of the study is to evaluate the effectiveness of NAGs in ameliorating patients' suffering from cervical spine pain and stiffness.

Methodology: The methodology used in this study is a repeated measure design, double blind, and randomized controlled clinical trial with four different treatments. Visual Analogue scale (VAS) score, Range of Motion (ROM), Neck Disability Index (NDI), and State-trait anxiety inventory (STAI) were the dependent measures. McGill Pain Questionnaire (MPQ) was used for the assessment and screening of the subjects for the study and to develop demographic data.

Sample/Sampling and Design: One hundred patients (subjects), attending orthopaedic OPD, suffering from cervical spondylosis and meeting the predefined criteria were included in the sample. The sampling was incidental. The subjects were randomly assigned to 3 experimental groups and 1 control group. All the 4 groups received hot packs for 12 minutes along with set of active exercises from day 1 to day 12. In experimental Groups 1, 2, and 3, NAGs as mobilisation technique were added at different points of study, i.e. group 1 received NAGs from day 1 to 12, group 2 received NAGs from day 1 to 6, and group 3 received NAGs from day 7 to 12. Group 4 did not received NAGs on any day and got only placebo along with conventional physiotherapy as explained before. All subjects were assessed before and after the treatment on day 1, 2, 6, 7, 12, and 42 as follow up.

Analyses: The method of simple analysis of covariance (ANCOVA), post-hoc t-test with adjusted means, graphical presentations, and qualitative analysis were used for the analyses (Broota, 2008).

Results: While comparing group 1 vs 3, 1 vs 4, 2 vs 3, and 2 vs 4, a highly significant ($p < .01$) reduction in pain, increase in range of motion and improvement in neck disability index score are noticed among the groups immediately on day 1 after NAGs, and is maintained on 42nd day also. Along with increase in ROM, further decrease in VAS score at new available end ranges is noticed. However, ROM in side flexion to right is found to be only significant at .1 level of confidence. Non-significant difference obtained between group 1 and 2. Comparing Group 3 vs 4 on 7th day, as the NAGs introduced to Group 3, a significant difference ($p < .01$) is recorded in terms of VAS and ROM.

In the present study, non-significant difference among groups is observed under STAI. It has been found that the anxiety level of the subjects in all the four groups reduced systematically as a function of trials. Systematic reduction in the STAI scores is obtained under all the four conditions; all the four curves being parallel give non-significant differences among the groups. Any type of treatment reduces the anxiety level of subjects; therefore, no specific differentiation could be derived for any of the experimental groups.

Discussion: Group 1 receiving NAGs throughout showed a marked decrease in VAS scores, NDI score and increase in range of motion earlier than other 3 groups and the effects were long lasting. In Group 2, many of the subjects reported relief from symptoms in 1st six days. Little pain that still left in Group 2 was treated with conventional methods and the NAGs were stopped as per research design. Slowness in rate of recovery in Group 2 was seen after day 6, which, shows that conventional therapy and placebo was also able to reduce pain but recovery facilitates with NAGs. The effectiveness of NAGs on neck pain and stiffness becomes more concrete by analysing study of Group 3, which, showed dramatic improvement after receiving NAGs from day 7 to day 12. However, Group 4 did not received NAGs showed the slowest recovery in terms of Pain, ROM and NDI score. It was interesting to find that though every group was showing improvement in range of motion but rate of improvement increased drastically when NAGs is employed.

Attributing this recovery to the positional fault theory (Exelby, 2002), mechanical neck pain is usually associated with zygapophyseal joint mal-tracking. Mulligan in 2004 stated that physiology of NAGs could be explained as appropriate accessory movement correcting the mechanical block within a joint and making the joint return to its physiological position. Sympatho-excitatory effect of this Mulligan technique (NAGs) can also be taken into account to advocate the decrease in pain (Moulson and Watson, 2006). NAGs are able to correct minor joint derangements that often display a disproportionate array of effects (Wilson, 2001). Increase in ranges is because of the capability of NAGs to bring facet joints to normal position, release entrapped meniscoid and brings change in length of connective tissues structure such as joint capsule of the ligaments and muscle (Hearn and Rivett, 2002). Core of Mulligan's work in symptom free joint mobilization adds to muscular activity, better plane of movement and added muscular activity increase the range of motion and decrease the pain at available end range. Thus, better accessory movement brings better physiological movement, which in turn has affected the efficacy of daily routine work and NDI scores positively. A decline in anxiety level from pre-treatment data seen in all 4 groups can be due to lesser pain and increased efficiency in performing daily activities. However, anxiety as a dependent measure has not been able to demonstrate

specifically the superiority of NAGs over the conventional methods of treatment, as any type of treatment reduces the anxiety level of the subject.

Conclusions: The study brings out that the Mulligan concept (NAGs) is a useful manual therapy technique for achieving faster results when measured in terms of VAS, ROM, and NDI. While improving range of motion it is also helpful in decreasing pain at available end range simultaneously in the subjects suffering from cervical pain and stiffness. It is also seen that better ranges and lesser pain have a positive effect on activities of daily living. The non-significant differences in terms of STAI, among the four groups, perhaps, indicate that the comparison of four groups as a whole is not a valid criterion to study the relative efficacy of NAGs. The anxiety level in all the four groups reduced systematically as function of trials and the slopes of all the four curves are parallel. It establishes the effectiveness of employing the technique in the treatment of cervical spine pain and stiffness.

Limitations: As the numbers of elderly participants were less in the sample size of 100 subjects, the results of the study cannot be generalized to larger population. Apart from it, the study has been carried out with sample from one population; replicating the study with different populations could obviate this deficiency. Besides treating cervical pain with NAGs, heating modality, and exercises were also introduced to take care of the ethical problems involved. The VAS score as a dependent measure for assessing pain is a limitation to the extent that it is a subjective way of reporting improvement. Since the present study is the first of its kind, finding the efficacy of NAGs in treating cervical pain and stiffness, non-availability of data from other sources stands as a limitation. In the present study there was one therapist involved in administering the treatment. It may be instructive to include more number of therapists with a factorial design, therapist being another factor in the study.

Keywords: NAGs, VAS, ROM, ADL, STAI, Anxiety, Mulligan concept, Manual therapy, Cervical spine, Pain, and Stiffness.