

# Short-term Effect of Mulligan SNAGs on Pain Intensity, Cervical Range of Motion and Craniovertebral Angle in Patients with Non Specific Neck Pain: A Quasi-experimental Study

KARTHIK VIJAYAN<sup>1</sup>, ARULPRAGASSAME SIVARAMAN<sup>2</sup>, PARKAVI KUMARESAN<sup>3</sup>, JAYALAKSHMI PALANI<sup>4</sup>

## ABSTRACT

**Introduction:** The extended use of smartphone, laptops and computers alters the posture of the neck which results in non specific neck pain. Though the physical therapy modalities give symptomatic relief, the forward head posture is left uncorrected. Mulligan Sustained Natural Apophyseal Glides (SNAGs) stimulate the mechanoreceptors and proprioceptors around the joints that might correct the faulty posture of neck.

**Aim:** To evaluate the short-term effect of mulligan SNAGs on pain intensity, cervical range of motion and craniovertebral angle in patients with non specific neck pain.

**Materials and Methods:** This quasi-experimental study was conducted in Department of Physical Medicine and Rehabilitation at Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India, from August 2021 to October 2021. Total 20 patients diagnosed having non specific neck pain and Craniovertebral angle (CV) angle less than 45 degrees were included in the study. The participants were randomly allotted into two groups. Group A received interferential therapy and static neck exercises. Whereas, group B received Mulligan SNAGs in addition to interferential therapy and static neck exercises and serves as the experimental group. Mulligan SNAGs was given to each cervical movement as six repetitions x two sets/ session x three sessions/week. The intervention was given for two weeks. Preintervention and postintervention evaluation of pain

intensity, cervical range of motion and CV angle was made and statistically analysed using Paired t-test for within group analysis and independent t-test for between group analysis at 5% level of significance (p-value <0.05).

**Results:** The mean age the participants in group A was (32.2±6.3 years) and group B was (32.7±6.03). Within group analysis was made and it was observed that group A and B showed significant reduction in Numerical Pain Rating Scale (NPRS) score (p-value=0.004, p-value=0.005), improvement in CV angle (p-value=0.001, p-value=0.001) and increased cervical range of flexion (p-value=0.001, p-value=0.001), cervical extension (p-value=0.004, p-value=0.001) and rotation movements (p-value <0.05), respectively. The between group analysis of pre-post mean differences in the NPRS score (3.30±0.67, 4.60±0.96), CV angle (0.46±0.24, 5.62±1.21), cervical movement of flexion (10±2.36, 19±4.59), extension (6.50±2.53, 21±8.23), right lateral rotation (8±2.58, 15±4.08) and left lateral rotation (8.5±2.49, 16±4.24) was made using Independent samples t-test. It was observed that, all the outcomes showed significant difference. The mean difference in the outcome measures were significantly greater in group B who received mulligan SNAGs than group A.

**Conclusion:** Thus, the short-term application of Mulligan SNAGs along with conventional physiotherapy proves good in reducing pain, improving cervical range of motion and normalising the reduced CV angle in patients with non specific neck pain.

**Keywords:** Electronic head posture instrument, Forward head posture, Interferential therapy, Mulligan sustained natural apophyseal glide

## INTRODUCTION

Forward Head Posture (FHP) is one among the common types of the poor head posture seen in patients with neck disorders [1-3]. This postural alteration is aggravated by the habit of sleeping with elevated pillows, extended time spend on computers, laptops and cell phones, poorly developed cervical extensors strength and in calcium deficiency too [2-4]. The FHP can be well described as “carrying the head forward to the Centre of the shoulder” [4]. In patients with FHP, the occiput and upper cervical spine tilted forwards and the lower cervical spine and upper cervical vertebrae goes backward excessively i.e., the Anterior Translation of Head (AHT) [5,6]. This makes the individual susceptible to disorders of vertebral bodies, neck pain, alteration of soft tissue length and strength, head ache, temporomandibular disorders and even results in movement disorders of scapula and shoulder [7,8].

Most of the young population experiences the complaints of neck pain without any specific diagnosis. This type of neck pain whose

underlying cause cannot be traced to any specific systemic disease is called Non Specific Neck Pain (NSNP) [9]. Assessment of head posture is essential in patients with NSNP [10]. It can be done by measuring Craniovertebral (CV) angle [10,11]. The CV angle can be measured by various methods like photogrammetric method using software's [1,11-13]; drawing lines in the lateral cervical radiographs [14], head posture spinal curvature instrument [10] and by Electronic Head Posture Instrument (EHPI) [7]. The intrarater (r=0.86-0.94) and intrarater reliability (r=0.85-0.94) of EHPI was high and found to be a reliable tool to measure CV angle in subjects with and without neck pain [14]. Lau HMC et al., established a significant negative correlation (r=-0.71) between the CV angle measured by EHPI with the ATH measured in lateral cervical radiographs and demonstrated EHPI as a valid tool to assess CV angle [15]. A study employs EHPI to evaluate the CV angle as its measurement was accurate to one decimal place [16].

Many treatment strategies are available to treat neck pain. Modalities give symptomatic relief but manual therapy targets the source of

problem and corrects the faulty posture. Mulligan is gaining its significance as mobilisation technique that can be applied in neck pain patients and used by most of the manual physical therapist [17]. A glide was applied to the apophyseal joints of affected cervical vertebra to reduce pain [18]. Mulligan SNAGs includes movement that helps to provide nutrition to facet joints and disc. It might stimulate the mechanoreceptors and proprioceptors in and around the joints and spontaneously improves the pain free range of motion in the involved joints. It also corrects the positional fault taken place in opposite direction between affected facets. Hence, correcting the biomechanics of the affected joints [17,18].

Mulligan SNAGs was found to be effective in reducing pain, improving cervical range of motion and neck disability when administered for the period two weeks and four weeks in patients with neck pain [19-21]. The effect of mulligan SNAGs on CV angle is less focused and need to be studied. The present study intends to find the short-term effect of Mulligan SNAGs technique in managing pain intensity, improving active cervical range of motion and CV angle in patients with non specific neck pain. The findings may help in identifying Mulligan SNAGs as a treatment strategy to manage and prevent NSNP in young adults. This may improve their work efficiency and may postpone their ailments of neck due to poor posture.

## MATERIALS AND METHODS

This quasi-experimental pilot study was conducted in the Outpatient Department of Physical Medicine and Rehabilitation at Rajah Muthiah Medical College and Hospital (RMMCH), Annamalai University, Chidambaram, Tamil Nadu, India, from August 2021 to October 2021. Ethical clearance was obtained from the Institutional Human Ethics Committee (IHEC/595/2019) of RMMCH. Among 36 neck pain patients screened during the study period, 20 participants those who have clinically diagnosed as having NSNP and CV angle less than 45 degrees were conveniently recruited as per the selection criteria [9,11]. Patients informed written consent was obtained.

**Inclusion criteria:** All patients between 20-40 years of age with both genders, primary complaint of neck pain along with restricting movement for more than a week were included in the study.

**Exclusion criteria:** Patients with recent systemic illness, cervical and thoracic fracture, structural abnormalities, torticollis, balance disorders and psychotic problems were excluded from the study.

The study population was recruited by convenient sampling method and the group distribution followed simple random allocation method.

- **Group A (n=10):** Received Interferential therapy and isometric neck exercises. Served as control.
- **Group B (n=10):** Received Mulligan SNAGs along with Interferential therapy and isometric neck exercises. Served as the experimental group.

### Study Procedure

**Interferential therapy:** The patient was positioned in forward lean sitting with adequate pillow support. Bipolar method of Interferential Therapy (IFT) was applied over the para-cervical region for 10 minutes [22]. The frequency range selected for treatment was 80-100 Hz rhythmic and the intensity applied depends on patient's comfort. Both groups received single session of IFT for five consecutive days of first week [Table/Fig-1].

**Mulligan SNAGs:** Patient was made to sit upright comfortably on a chair. Therapist stands behind the patient and places the medial border of the thumb as the stabilising hand under the spinous process of the desired (painful) level of cervical vertebra. The pulp of the thumb of other hand acts as the mobilising hand of the therapist and reinforces the lateral side of the previous thumb (i.e. stabilising hand). Fingers of the both hand were placed comfortably around the mandible.

Patient was asked to perform the painful or restricted movement actively. Therapist applies an anterior glide to the spinous process

of desired cervical vertebra as if pushing it towards the eyeball. The glide was given throughout the movement [17]. Mulligan SNAGs was given to each cervical movement as six repetitions of two sets/session and three sessions per week for a period of two weeks. The treatment session lasts for 15-20 minutes with rest in-between the sets [Table/Fig-2].



[Table/Fig-1]: Bipolar method of Interferential therapy.

[Table/Fig-2]: Group B receiving Mulligan SNAGs. (Images from left to right)

**Isometric neck exercises:** Both group performed isometric neck exercises for neck flexors, extensors and rotators [19,23]. The isometric neck exercise protocol was five seconds hold×10 repetitions of each exercise/day×three days/week for two weeks. The control group was followed-up for supervised isometric neck exercises.

### Outcome measures:

- Initial evaluation of pain intensity was done using Numerical Pain Rating Scale (NPRS) [24].
- The active range of cervical flexion, extension and cervical rotation was measured by goniometer [25].
- The CV angle was measured by the Electronic Head Posture Instrument (EHPI) an electronic angle finder, mounted on a transparent plastic base and a tripod camera stand. The CV angle is formed by drawing a horizontal line through the spinous process of the 7<sup>th</sup> cervical (C7) vertebra and a line joining the spinous process of C7 vertebrae with the tragus of ear. The electronic sensor of EHPI reads the angle automatically [15,16].

Post intervention assessment was made after two weeks.

## STATISTICAL ANALYSIS

The preintervention and postintervention evaluation of outcome measures were documented and statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21.0). Normal distribution was checked using Shapiro-walk test of normality. Frequency distribution of age and gender was made using descriptive statistics. Levene's test for equality of variances was used to analyse the age differences between groups. As the data follows the normal distribution, Paired t-test was used for within group analysis and independent t-test was used for between group analyses at 5% level of significance (p-value <0.05).

## RESULTS

The mean age of the participants in group A was 32.2±6.3 years and of group B was 32.7±6.03 years. On comparing the mean age of both groups using Levene's test [Table/Fig-3]. The obtained F value was 0.03 which was not significant with the p-value=0.865.

The mean pre and post intervention values of NPRS score, CV angle and active range of cervical flexion, cervical extension, cervical right and left lateral rotation movements of group A and B were compared and demonstrated a significant improvement in outcome variables [Table/Fig-4].

Variables	Group A (n, %)	Group B (n, %)
Age (Mean±SD), in years	32.2±6.33	32.7±6.03
<b>Age range (years)</b>		
20-25	2 (20%)	2 (20%)
26-30	1 (10%)	1 (10%)
31-35	3 (30%)	3 (30%)
36-40	4 (40%)	4 (40%)
<b>Gender</b>		
Males	4 (40%)	5 (50%)
Females	6 (60%)	5 (50%)

**[Table/Fig-3]:** Demographic characteristics of study population.

Variables	Group A			Group B		
	Mean±SD	t value	p-value	Mean±SD	t value	p-value
<b>NPRS</b>						
Preintervention	7.0±1.05	2.86	0.004	7.30±1.16	2.83	0.005
Postintervention	3.7±0.95			2.70±1.25		
<b>CV angle (in degree)</b>						
Preintervention	41.92±1.89	6.15	0.001	40.23±1.97	14.69	0.001
Postintervention	42.38±1.78			45.85±1.83		
<b>Cervical flexion (in degree)</b>						
Preintervention	43.5±9.14	13.42	0.001	42.0±7.15	2.86	0.001
Postintervention	53.50±9.14			61.0±3.94		
<b>Cervical extension (in degree)</b>						
Preintervention	40.0±5.77	2.92	0.004	35.5±8.96	7.87	0.001
Postintervention	46.50±4.12			56.50±6.69		
<b>Cervical right lateral rotation (in degree)</b>						
Preintervention	68.50±4.74	2.89	0.004	53.5±6.69	2.84	0.005
Postintervention	63.0±6.32			55.0±6.67		
<b>Cervical left lateral rotation (in degree)</b>						
Preintervention	56.50±7.09	11.13	0.001	54.0±4.15	2.82	0.005
Postintervention	65.0±6.67			70.0±3.33		

**[Table/Fig-4]:** Within group analysis of outcome variables.

The p-value <0.05 was considered as significant

It was observed that all the outcome variables showed significant improvement (p-value <0.05). The CV angle and cervical extension shows significantly higher improvement in group B (p-value=0.001) with greater mean difference of 5.62±1.21, 21.0±8.23, respectively [Table/Fig-5].

Variables	Group A	Group B	t value	p-value
	Mean±SD	Mean±SD		
NPRS	3.30±0.67	4.60±0.96	2.82	0.005
CV angle	0.46±0.24	5.62±1.21	13.23	0.001
Cervical flexion (in degree)	10.00±2.36	19.00±4.59	3.81	0.001
Cervical extension (in degree)	6.50±2.53	21.00±8.23	3.55	0.001
Cervical right lateral rotation (in degree)	8.00±2.58	15.00±4.08	3.28	0.001
Cervical left lateral rotation (in degree)	8.5±2.49	16.00±4.24	3.27	0.001

**[Table/Fig-5]:** Comparison of the mean difference of outcome variables between groups.

The p-value <0.05 was considered as significant

## DISCUSSION

It was observed from the present study that most of the patients have NSNP in their third decade. The mean age of the participants was homogenous in both groups. Both groups improved significantly after the intervention for two weeks. On comparing the pre and post mean difference of the two groups, it was found that group B who received Mulligan SNAGs technique showed significant improvement in CV angle than group A who received conventional therapy alone. Among the cervical movements, the

cervical extension range gained by Mulligan SNAGs was much higher than group A.

Interferential therapy was delivered at a frequency of 80-100 Hz in the current study. Wedensky inhibition of type c-fibers and pain gate activation at 80-100 Hz were the proposed mechanism behind the effect of IFT [26,27]. Sutariya N et al., compared the effect of short wave diathermy and IFT in reducing pain and improving function of mechanical neck pain patients and recommended IFT as an adjunct to therapeutic exercises for greater benefits [28].

An isometric neck exercise of three supervised sessions per week for 12 weeks was found to be clinically more effective in reducing pain, neck disability and improves neck range of motion in patients with chronic non specific neck pain [29]. The present study also implemented supervised neck isometrics three sessions a week for two weeks. Ali A et al., preferred the combination of isometric neck exercises with Mulligan SNAGs in non specific neck pain [30]. Thus, the role of IFT and isometric neck exercises in reducing pain and improving pain limited range of motion in NSNP was inevitable and might contribute to the significant pain reduction and improved cervical range of motion.

Mulligan SNAGs was widely used to treat neck pain. The current study established a significant gain in CV angle and cervical range of motion especially the cervical extension which was affected by forward head posture. Tanveer F et al., compared Mulligan cervical SNAGs with Maitland mobilisation in neck pain and demonstrated the former was effective [31]. Whereas, Abdullah Al et al., found Maitland as effective in improving symptoms of neck pain [21]. Siddapur T et al., examined the immediate effects of sub-occipital release technique versus Cervical SNAGs on pain in females having FHP and concluded, though both the techniques significantly decreases pain, the suboccipital release was clinically more effective via immediate pain relief [18]. Kim SY et al., studied the effects of cervical SNAGs on FHP and respiratory function. The findings strongly favored the effect of cervical SNAGs in increasing the CV angle, reducing the neck pain, improving the cervical range of motion and improve their respiratory function [20].

It was clearly evident that in terms of increasing the reduced CV angle Mulligan SNAGs was effective. The apophyseal glide given during the Mulligan SNAGs unlocks the jammed facet and the structures on the convex side of offending movement get stretched. It also releases any trapped meniscoid between the facet joints. Further, it might stimulate the proprioceptors and mechanoreceptors in and around the joint and sets the muscles around free [17,30]. Its effect on reducing pain, disability and increasing cervical range of motion in neck pain was well established [19-21,23,31]. But its role in normalising the reduced CV angle and correcting the faulty neck posture need to be studied. Further studies about the effect of Mulligan SNAGs on other cervical dysfunctions were recommended. The long-term effect of Mulligan SNAGs on FHP can be studied and subsequent follow-up evaluation of CV angle can be done.

## Limitation(s)

The present study was a pilot study and has limited sample size. The experiment was conducted in young adults of 20-40 years of age for limited period of time. The effects of treatment on people of various ages were not examined. The present study only focused on NSNP patients.

## CONCLUSION(S)

The present study concluded that, a short-term Mulligan SNAGs along with conventional physiotherapy was found to be more effective in reducing pain, improving cervical active range of motion and normalises the decreased CV angle in patients with non specific neck pain.



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### PARTICULARS OF CONTRIBUTORS:

1. Lecturer in Physiotherapy, Department of Physical Medicine and Rehabilitation, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India.
2. Lecturer in Physiotherapy, Department of Physical Medicine and Rehabilitation, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India.
3. Lecturer in Physiotherapy, Department of Physical Medicine and Rehabilitation, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India.
4. Physiotherapist, Department of Physical Medicine and Rehabilitation, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Karthik Vijayan,  
Lecturer in Physiotherapy, Department of Physical Medicine and Rehabilitation,  
Rajah Muthiah Medical College and Hospital, Annamalai University,  
Chidambaram-608002, Tamil Nadu, India.  
E-mail: kar\_1822003@yahoo.com

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