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# COMPARATIVE STUDY TO FIND THE EFFECT OF MULLIGAN'S SNAG TECHNIQUE (C1-C2) VERSUS MAITLAND'S TECHNIQUE (C1-C2) IN CERVICOGENIC HEADACHE AMONG INFORMATION TECHNOLOGY PROFESSIONALS

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## ABSTRACT

***Background:*** Headache is a common condition which physiotherapists have to deal with in clinical practice.Headaches which arise from the cervical spine are termed as Cervicogenic headaches (CGH), and these types of headaches are common form of a chronic and recurrent headache.The diagnostic criteria for CGH are outlined by the IHS (International Headache Society). The upper cervical joints, namely the occiput-C1 and C1-C2 segments are the most common origin of pain. Office and computer workers have the highest incidence of neck disorders than other occupations; the prevalence of neck disorders is above 50% among them. The purpose of this study is to find the effectiveness of Mulligan's SNAG technique (C1-C2) and Maitland's technique (C1-C2) in CGH and to compare these manual therapy techniques (Mulligan's SNAG technique and Maitland's technique) with a control group.

***Methods:*** 30 subjects were selected for the study among them 23 subjects completed the study. The subjects were randomly allocated to 3 groups. The range of motion (ROM) and severity of a headache were assessed pre and post intervention using FRT and HDI respectively.

***Result:*** The comparison revealed that SNAG group had a greater increase in cervical rotation ($p<0.01$) range than the Maitland's technique and control groups. The mean value between pre-post differences shows a decrease in severity of headache among all three groups. The significant difference between 3 groups was found through Tukey's post hoc test using ANOVA method (Group A versus Group C; $p<0.01$ and Group B versus Group C; $p<0.05$).

***Conclusion:*** The present study suggested that C1-C2 SNAG technique showed statistically significant improvement in reducing headache and disability when compared to the Maitland's mobilization technique among cervicogenic headache subjects.

***Keywords:*** A cervicogenic headache, FRT, Manual therapy, Mulligan's SNAG technique, Maitland's technique, Computer workers.

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## INTRODUCTION

Headache is a common condition which physiotherapists have to deal with in clinical practice [1]. Headaches which rises from the cervical spine are termed as Cervicogenic headaches (CGH), and these types of headaches are common form of a chronic and recurrent headache [2]. The term was described by Sjaastad et al. (1983) who also proposed the diagnostic criteria for CGH [3]. In 1990, the Clinical Characteristics of CGH were described (by Sjaastad et al.) The CGH can be diagnosed with three sets of symptoms, i) a unilateral headache due to movements of head/neck or poor posture. ii) A unilateral headache due to pressure on the neck. iii) A headache which radiates to neck or shoulder region and the diagnostic criteria were designed by IHS also which includes subjective features as well as impairment in cervical movements on physical assessment [4, 5]. Individuals who experience CGH, they suffer from difficulty in daily activities, Participation restriction, and emotional distress. In addition to these, Individuals also have alower quality of life than others [1]. The upper cervical joint segments; occiput-C1 and C1-C2 have the most common origin of pain [6]. Zito et al. (2006) gave importance in a detailed examination of C1-C2 segments in accurate diagnosis [7]. Hall and Robinson (2004) have suggested The Cervical flexion-rotation test (FRT) diagnose the C1-C2 dysfunction [4]. Ogince et al. (2007) found that movement impairment on FRT has high sensitivity and specificity to identify CGH at C1-C2 segments [1,7,8]. The manual examination of CGH also found the weakness of deep neck flexors and tightness of upper trapezius, levator scapulae, and sternocleidomastoid muscles [6]. The prevalence of CGH is 13.4-35.4% in overall headache population [3,9].

In computer workers, musculoskeletal complaints like neck pain, shoulder pain, and radiating pain are common in modern society [10]. Office and computer workers had the highest incidence of neck disorders than other occupations, the prevalence of neck disorders are above 50% among them [11]. Posture is one of the main risk factors among computer users; different postural factors can be the reason to affect the integrity of daily activities and also worsen the performance [12, 36]. Watson and Trott (1993) has noted that forward head posture was common in CGH patients due to restricted ROM, reduced strength and weakness of deep neck flexor muscles [13]. CGH is the secondary type of a headache, and the diagnosis is relatively new, the particular etiology remains unclear.

A systematic review has done by Aleksander Chaibi and Michael Russell (2012), they suggested that manual therapy might be an effective management for cervicogenic headache because Manipulative therapy found to be an effective technique for the CGH [14]. The maitland'stechnique is a passive mobilization; thereare rhythmic oscillatory movements of the vertebrae, itdemonstrates the mechanical effects which include apermanent or temporary change in length of connective tissues [15, 16]. Mulligan's techniques are claimed to improve the signs and symptoms and do so more rapidly than other treatments alone, but the reasons for this are not clear [17].

The objective of the study is to find the effectiveness of Maitland's mobilization (C1-C2) technique in CGH and compare these manual therapy techniques (Mulligan's SNAG technique and Maitland's technique) with a control group.

## METHODOLOGY

Inclusion Criteria: Age Group 25-35 years, Persons fulfilling the diagnostic criteria given by IHS (International Headache Society) [1] and Positive FRT (flexion-rotation test) and restricted ROM.

Exclusion criteria: Dizziness or visual disturbance symptoms, Headache which is not of cervical origin, Known congenital, inflammatory and infectious condition of thecervical spine, any indication of vertebrobasilar insufficiency,Cervical Hypermobility and Patients on medication (Steroids, or Analgesics) [34].

## PROCEDURE

30 subjects were selected based on the selection criteria, and informed consent was obtained from them. The detailed manual examination was carried out including manual therapy assessment and sharp purser test to check the cervical hyper mobility [37]. The subjects were randomly allocated into three groups through lottery method.

Before the treatment, outcome measures were obtained from all the subjects. The cervical flexion-rotation test (FRT) and Headache disability indexwere performed. The duration of the study was one week (6 sessions) for each group.

The Cervical flexion-rotation test: (FRT) [5, 17].

The subject will be in aSupine lying position. Examiner will move neck in theend range of cervical flexion after that examiner rotates the head passively within subject's comfort limits. The range will be measured, and movement will be repeated three times in each direction for accurate measurement. After that, theexaminer will check significant restricted movement and direction of the restricted motion. Interpretation will be made based on the ROM, which should be greater than 10 degrees. This test is shown to be positive in CGH patients who have affected C1-C2 segments, but the test will be negative in patients with CGH other than theinvolvement of C1-C2 segments.

**Group A:** (Mulligan's SNAG tech.)

The patient will be in sitting position and therapist will be standing behind the patient. Examiner will place the thumb on the spinous process of the vertebra above the site of thelesion. Move spinous process upwardtowards eyeball direction and maintain this glide and ask thepatient to turn(rotation) his head slowly in restricted painful direction, sustain the mobilization until head returns to the midline [18]. Four repetitions of each glide were given and were maintained for 10 seconds at end range or the onset of pain [19, 33].

**Group B:** (Maitland's Mobilisation)

The patient will be in prone lying position and therapist will be standing. Upper cervical vertebrae (C1-C2) were palpated to perform glides. Central PA (postero-anterior), lateral PA and transverse glideswere given to the patients. For each glide 3 to 5 repetitions were given, and for each repetition, 60-120 oscillations were given (2-3 oscillations per second for 1 to 2 minutes) [20,21,22].

Apart from the application of manual therapy techniques, intervention groups (Group A and B) performed exercises (Stretching, Active ROM exercises and strengthening exercises) under thesupervision of the therapist.

**Group C:** (Control group)

A control Group was given active neck Range of motion exercises, strengthening of deep neck flexors and stretching of upper trapezius and sternocleidomastoid (SCM) muscles [23]. For This group, theone-time demonstration was given by the therapist. Subjects were informed to do exercises twice a day (morning and evening).

After one week of thetreatment session, outcome measures were obtained from all patients.

## RESULTS

All data were analyzed. An analysis of variance (ANOVA) was used to analyze CervicalFlexion-Rotation test (ROM with cervical spine in flexion) between and within three groups. The Krushkal Wallis test was used to analyze the HeadacheDisabilityInventory (HDI). Tukey's HCD post hoc test was used to signify the difference between 3 groups using ANOVA method.

Descriptive Analysis:

30 subjects with cervicogenic headache were eligible for the study. 23 subjects participated in all assessments and treatment sessions. The primary reason given for dropping out was due to time constraint. There were twodropouts in the SNAG group, threedropouts in the Maitland's mobilization group and twodropouts in the control group. There were no side effects of events reported with any intervention.

Demographic characteristics and baseline measures of all data are presented in Table 1. The average age of all subjects was 28.1(± 1.52). No significant differences between groups were found for other baseline variables and pre-treatment data (p>0.05). The mean duration of computer work is 4.93 in years (± 2.4).

**TABLE 1:** Demographic characteristics and baseline measures of all the 3 groups

| | DEMOGRAPHIC CHARACTERISTICS AND BASELINE MEASURES | | | |
|---|---|---|---|---|
| | All data are presented as MEAN ± CI | | | |
| **Characteristics** | **Group A N=(8)** | **Group B N=(7)** | **Group C N=(8)** | **p** |
| Age in Years | 26.8 ± 1.5 | 31 ± 2.09 | 26.5 ± 0.98 | 0.001 |
| Gender(M/F) | 4/ 4 | 2/ 5 | 6/ 2 | |
| Cervical rotation ROM | 30 ± 2.01 | 31.4 ± 1.64 | 31.8 ± 1.8 | 0.38 |
| Duration of working experience (In years) | 4.75 ± 3.13 | 6.25 ± 2.17 | 3.81 ± 1.92 | 0.18 |
| Symptomatic side (left/right) | 3/5 | 2/5 | 4/4 | |
| Headache Disability Inventory (%) | 51.5 ± 8.59 | 56.8 ± 8.52 | 58 ± 10.26 | 0.41 |

Comparison of outcome measures between all three groups is presented in Table 2. It shows improvement in all three groups for cervical rotation ROM but SNAG group (Group A) is having more improvement than other groups. There was also significant improvement found in severity of a headache after the intervention.

**Table 2:** Comparison of outcome measures for all groups

| **Outcome Measures** | **Treatment period** | **Group A (Mulligan's SNAG tech.)** | **Group B (Maitland's Mobilization tech.)** | **Group C (control group)** |
|---|---|---|---|---|
| | | Mean± CI | Mean± CI | Mean± CI |
| FRT | Pre | 30 ± 2.06 | 31.4 ± 1.64 | 31.8 ± 1.83 |
| | Post | 39.3 ± 1.43 | 38 ± 1.48 | 34.7 ± 1.8 |
| HDI | Pre | 51.5 ± 8.59 | 56.8 ± 8.52 | 58 ± 10.26 |
| | Post | 32.2 ± 8.52 | 32.8 ± 8.82 | 45.25 ± 6.72 |

Analytical Result:

Flexion rotation test (FRT):

One-way analysis of variance (ANOVA) for thecervicalflexion-rotation test is presented in Table 3. It was conducted to compare the baseline data and thepre-post difference between 3 groups (Graph 1). It shows asignificant effect of FRT at the p<0.05 level for the three groups. [F (2, 20) =15.72, P= 0]

The details of cervical rotation ROM in all groups during the study are shown in Table 4. The comparison revealed that SNAG group had agreater increase in cervical rotation (P<0.01) range than the Maitland's technique and control groups. Maitland's group moderately increased in rotation range; it was less than SNAG group but more than the control group.

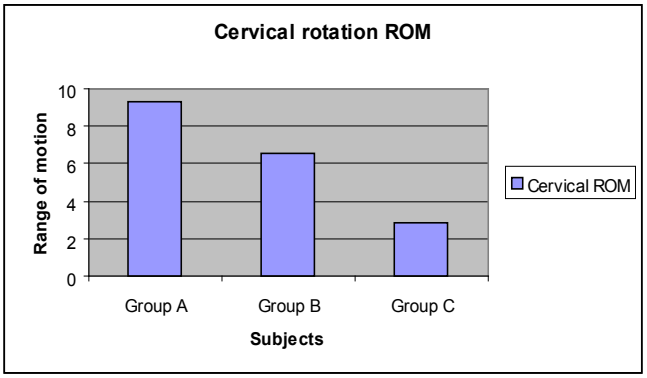
**Table 3:** One-way analysis of variance (ANOVA) for FRT for all 3 groups

| | | SS | Df | MS | F | p |
|---|---|---|---|---|---|---|
| Baseline | Between : | 14.177 | 2 | 7.089 | 1.012 | 0.381 |
| | Within : | 140.104 | 20 | 7.005 | | |
| | Total : | 154.281 | 22 | | | |
| Pre-Post Differ-ence | Between : | 169.986 | 2 | 84.993 | 15.72 | 0 |
| | Within : | 108.131 | 20 | 5.407 | | |
| | Total : | 278.117 | 22 | | | |

**Table 4:** Differences of cervical rotation ROM for all 3 groups

| ROM | | Group A (Mulligan's SNAG tech.) | Group B (Maitland's Mobilization tech.) | Group C (control group ) |
|---|---|---|---|---|
| Cervical Rotation (C1-C2) | Pre | 30 ± 2.06 | 31.4 ± 1.64 | 31.8 ± 1.83 |
| | Post | 39.3 ± 1.43 | 38 ± 1.48 | 34.7 ± 1.8 |
| | Pre-Post difference | 9.3 ± 2.09 | 6.57 ± 1.64 | 2.87 ± 1 |

**Graph 1:** Difference in Flexion rotation test (FRT) for all 3 groups




Tukey's HCD post hoc test:

The significant difference between 3 groups was found through Tukey's post hoc test using ANOVA method. It shows no significant difference between Mean of Group A and B. There is significant difference found between Group A versus Group C ($p<0.01$) and Group B versus Group C ($p<0.05$)

Headache Disability Inventory (HDI):

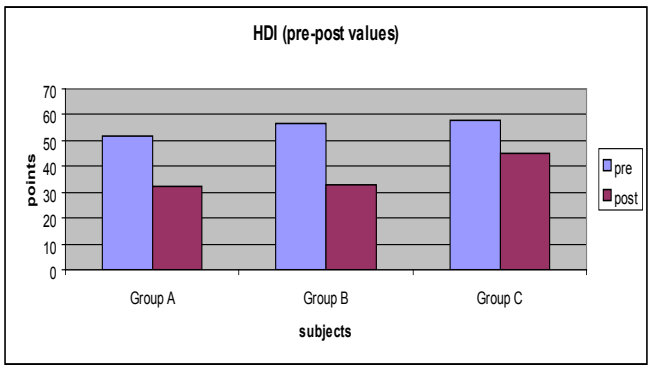
The krushkal Wallis test for HDI shows significant effects between groups. It was conducted to compare the baseline data and thepre-post difference between 3 groups. It shows asignificant effect of HDI at the p values.

**Table 5:** Krushkal Wallis test for HDI for all 3 groups

| | H | Df | p |
|---|---|---|---|
| Baseline | 1.78 | 2 | 0.4107 |
| Pre and Post diff. | 8.74 | 2 | 0.0127 |

The mean of pre-post values between all three groups shows that there is adecrease in severity of a headache among all three groups, but it was greater in manual therapy groups than thecontrol group (Graph 2).

**Graph 2:** Pre and post values of HDI for all 3 groups




## DISCUSSION

The aim of the study was to find the effectiveness of manual therapy techniques in cervicogenic headache among IT professionals. This study compared the effectiveness of mulligan's SNAG technique (C1-C2) against Maitland's mobilization technique(C1-C2), and also these two manual therapy techniques have been evaluated with a control group which involved only conservative management (free active exercises, strengthening of deep neck flexors and stretching exercises).

There was significant difference found in all three groups. Rattaporn S. et al. (2011) have suggested that continuous use of thecomputer will lead to static contraction of neck muscles, these continuous contractions accumulate $Ca^{++}$, and there will be disturbances in active muscles due to impaired metabolic waste removal mechanism and poor blood circulation. These changes will lead to micro lesions and pain due to lack of $O_2$& nutrition also from awkward postures, prolonged static positions and repetitive movements may reduce the length of soft tissues which will limit/restrict the available ROM. The manual therapy may hypothetically reduce thesymptoms [24, 25].

This study found improvements in Cervical Range of motion and subjects perceived satisfaction, so this study hypothesized that there would be asignificant difference between these two manual therapy techniques (SNAG technique and Maitland's mobilization technique) towards restricted area.

In CGH, Painful dysfunctions are commonly identified in upper cervical segments (C0-C1, C1-C2) [7]. It was measured by flexion-rotation test (FRT) which has good reliability and has high sensitivity and specificity in detecting restricted C1/C2 rotation range [8, 26]. There was an increase in upper cervical rotation movements immediately post treatment. The minimal detectable change for FRT is 7 degrees. So according to this, Mulligan's SNAG group has better improvement in range than other groups. There are studies which reported the similar result (Susan A. et al. 2008 and Toby Hall et al. 2007) in improving the CGH symptoms [1, 27]. There was also improvement found in Maitland's mobilization group, it was not as significant as SNAG group, but it was more than the control group. The mean values of pre-post differences for FRT are 9°, 6.5° and 3° respectively.

The severity of a headachewas measured by using Headache DisabilityInventory (HDI). It included 25 items with two subscales (emotional and functional) [28]. There was significant difference found in severity of a headache among all three groups immediately after treatment. Manual therapy groups showed more reduction in headache disability scores than the control group, HDI was useful in assessing the impact of a headache [29].

Susan A. et al. (2008) proposed that joint hypomobility-will lead to pain which further restricts the ROM [18, 27]. The above theory is supported by this present study which has shown improvement in ROM, pain, and integrity of a headache.

There are studies reported that strength training of neck muscles gives improvement in neck pain and also in reducing severe headache [30, 31, 35]. A systematic review by Anita Gross et al.(2009) suggested that multimodal care including manual therapy with exercises is more beneficial than mobilization alone, the current study has also incorporated the exercises along with the manual therapy techniques [32].

## CONCLUSION

The present study found that the Manual therapy techniques (Mulligan's SNAG technique and Maitland's technique) have shown areduction in cervicogenic headache and its associated disability, but the Mulligan's SNAG technique found statistically significant improvement when compared to the Maitland's technique.

### ABBREVIATIONS:

I. T.: Information Technology
CGH: Cervicogenic headache
FRT: Flexion Rotation Test
HDI: Headache Disability Inventory
SNAG: Sustained Natural Apophyseal Glide
IHS: International headache society

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